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Book Reviews

Jane Hawking
Music to Move the Stars
London: Macmillan, 1999. 594pp. hb. £20.00. ISBN 0-333-74686-4

Jane Hawking's account of 'A Life with Stephen' is an unusual book to be reviewed in *Science and Christian Belief*, for it contains little science, and the author's Christian faith emerges only slowly and idiosyncratically as the book progresses. In some ways it is an unremarkable story, interesting in a domestic sort of way, a tale of academic life in Cambridge from the late 1960s to the early 1990s. As Jane herself remarks (587), much of it is 'quite ordinary, quite common to most people's lives, were it not for two factors: motor neurone disease and genius'. Even the tragic denouement of marital breakdown is not unusual – after all approximately one in two marriages ends in this way. However, the strain placed on the relationship by sickness and fame only make its survival for almost twenty five years the more remarkable. That it lasted so long is an enormous tribute to Jane, who spent so much of that time feeling that in the eyes of others she was of no consequence and that apart from Stephen she was nobody. One can only admire the incredible energy and devotion with which she cared, often single-handedly, for a seriously disabled husband as well as their three children and still managed, somehow, to have a blossoming career of her own, and involve herself in the arts and in charitable work. She comes across as the sort of person for whom no challenge is too great, for whom every problem must necessarily have a solution. Perhaps it is this can-do attitude that makes her final desertion by Stephen all the more cruel.

Post-mortems of dead marriages do not make cheerful reading, but this is a moving story. At almost 600 pages, it is long: a shorter account would have been more gripping, but Jane Hawking seems to want every detail recorded. On the whole she manages to maintain interest by her accounts of academic activity, by a liberal sprinkling of famous names, and by fascinating social vignettes of Cambridge life. Among the most interesting sections of the book are the accounts of her own work on Mediaeval Spanish love poetry, which in parts is so reminiscent of *The Song of Solomon*, her discussion of the role of Spain in anticipating twelfth century intellectual expansion in Western Europe, and of the development of ideas about cosmology since mediaeval times. Here one feels that one sees the real Jane, unencumbered by the difficulties of her daily life, able to express herself with enthusiasm and passion. And somewhere in her attempts to come to grips with ideas about the universe, she becomes increasingly convinced that the sterile rationality and mathematical beauty of twentieth century cosmology lacks an essential ingredient – God. If Jane's first spiritual leanings came from philosophical considerations, her final conviction 'that God does exist as the ultimate power of goodness' (572) came after the separation, through experiencing the love and support of her friends. But perhaps the key to why her book should be read is her foreboding insight into the power of academic endeavour to become 'a relentless rival….an inexorable siren' (80) and the observation that 'A spiritual home as well as a dependable family home is essential for every person…. It is at our peril that we neglect…deep-seated needs in favour of materialism, egoism, science or the

extremes of rationality' (592). Her book is a challenge to us all.

Diana Briggs was formerly a researcher in molecular and cell biology at the University of Oxford.

Michael Ruse

Mystery of Mysteries: Is Evolution a Social Construction?

Cambridge, MA and London: Harvard University Press, 1999. 296 pp., hb. £16.95/$27.50. ISBN 0-674-46706-X

A recurring claim by anti-evolutionists is that evolution is faith rather than science, resulting from materialistic (or naturalistic, or even atheistic) preconceptions; more crudely, that evolutionists have been brain-washed by social forces to accept ideas which have little or no scientific foundation. A common version of this claim is that evolution is 'only' a theory, and should be taught alongside other theories of origins such as scientific creationism. Often quoted is Karl Popper's notorious rejection of Darwinism as being a metaphysical research programme rather than a scientific theory. However, Popper's original comment referred only to natural selection (rarely cited is Popper's judgement that Darwin's core thesis of common descent is not only testable, but 'the most successful explanation' of the biological and palaeontological data; he took descent with modification as 'a historical fact') and he subsequently acknowledged that he had been wrong to assume that natural selection was not open to experimental tests. As an evolutionary biologist myself, I have always been mildly offended to be regarded as a scientific fraud, but it is not easy to defend oneself without appearing intolerably arrogant.

Michael Ruse's book is an examination of the nature of science: is it a rational pursuit based on objective data or is it a social construct buttressing a world view derived from entirely different inputs? He uses evolution to probe his questions. *Mystery of Mysteries* complements Ruse's *Monad to Man: the concept of progress in evolutionary biology* (Harvard U.P., 1996) which he describes as an attempt to understand biology from the viewpoint of philosophy; *Mystery of Mysteries* is the reverse endeavour, to understand philosophy from biology.

Ruse's starting point is the different and apparently conflicting approaches of Karl Popper and Thomas Kuhn. His question becomes: 'Does science obey certain disinterested norms or rules designed or guaranteed to tell us something abut the real world (as Popper assumed), or is it a reflection of personal preference, the things that people hold dear (as Kuhn believed)?' He seeks to answer this by examining the values explicit or implicit in the work of a procession of leading evolutionists from Charles Darwin's grandfather Erasmus, to the present day. His quest is to identify the importance of epistemic (truth-seeking as opposed to cultural) values in the science of his chosen group; his criteria for an epistemic value (derived from Ernan McMullin) are predictive accuracy, internal coherence, external consistency, unifying power, and simplicity. How do Erasmus Darwin, Charles Darwin, Julian Huxley, Theodosius Dobzhansky, Richard Dawkins, Stephen Jay Gould, Dick Lewontin, E.O. Wilson, Geoff Parker and Jack Sepkoski meet these standards?

The bulk of Ruse's book is a chapter by chapter discussion of each evolutionist's practice, dissecting the relative roles of epistemic and non-epistemic values in their scientific work and concentrating on their attitudes to progress as a marker of non-epistemism.

There is no difficulty with Erasmus Darwin: he was a deist for whom effort and ingenuity meant happiness and progress. There is a similar but less marked background to his grandson's writings, brought out very clearly in the big Desmond and Moore biography (*Dar-*

win, 1992). Upward and better was a major element in Julian Huxley's attitudes, although for him progress had a less materialistic base than it had for the Darwins (as shown by the laudatory introduction Huxley wrote to the English translation of Teilhard's *Phenomenon of Man*). With Dobzhansky we are brought much nearer to scientific objectivity. Building on the largely theoretical work of Ronald Fisher and Sewall Wright, he can be regarded as the first experimental evolutionist of the modern era. Ruse calls his chapter on Dobzhansky 'Evolution comes of age'. Dawkins is more complicated. He uses metaphors and cultural analogies freely in his writing and shows patent non-epistemic values in his animus towards religion. He can certainly be accused of propagating 'evolutionism' as well as scientific evolution, but in his exposition of evolutionary processes *sensu stricto*, he is concerned with consistency, coherence, explanatory power, etc., which characterise true epistemic values.

Gould and Lewontin have agendas linked to sociological issues, although they both relate these to scientific values. Gould is concerned about the recognition of palaeontology within science; Lewontin is a long-time crusader against assumptions of determinism in genetics. Ruse counsels caution in assessing the work of Gould and Lewontin, but finds no evidence that their scientific results are flawed or skewed by non-epistemic values.

Wilson has had a major interest and impact on cultural questions with his pioneering role in extrapolating sociobiology to human nature and his passionate advocacy of biological conservation. Ruse, however, acquits him of allowing his pioneering work on biogeography or on ants to be influenced by such questions, even though some of the motivation may come from Wilson's Southern Baptist roots.

Finally, Ruse discusses Parker, an English sociobiologist, and Sepkoski, an American quantitative palaeontologist. He concludes: 'On the value scale which judges between the epistemic and non-epistemic, they are virtually at the same point. They both take epistemic values very seriously, self-consciously so. They are both influenced by culture….[but] are both very wary about the intrusion of non-epistemic values into science'. Ruse's historical survey is heartening for those who care about the integrity of science. As he says: 'From primitive beginnings, we have now professional science: and it shows in the work being produced'. He draws three conclusions: the objectivists (the Popperians) have triumphed over the subjectivists (the Kuhnians); evolutionary studies have shown an 'ever greater manifestation and adherence to the epistemic norms'; and, although there are people who specialise in 'popular-science-level evolutionary theorising', we have seen a progressive diminution of cultural values within science to the extent that modern professionals actively spurn them.

He accepts that 'there is still something deeply cultural about evolutionary biology, even at its most mature or professional level. Through the language, the ideas, the pictures, the models, above all the metaphors that evolutionary biology uses, culture comes rushing back in. This was true at the time of Charles Darwin and it remains true at the time of Geoffrey Parker and Jack Sepkoski. From the tree of life to evolutionary stable strategies, we have culturally rooted metaphors: an idea from one domain, that of culture, is taken and applied to another domain, that of organisms'. But- and this is important- Ruse clearly separates cultural metaphors from cultural values. He says about Ed Wilson that he does not suppose 'when the white southerner talks about slave species of ants, he is thereby showing solidarity with the antebellum South … I am simply claiming that when evolutionary scientists turn to language to express their findings, the words they choose are often laden with metaphors taken from the

surrounding culture'.

Ruse believes that his review shows two different debates being confused: 'There is the old philosophical debate about realism/non-realism … nothing inferred from the history of science can be decisive on this. Then there is the new debate about standards and culture. Is science something special on its own, separate from other disciplines and from its pretenders?' Ruse's answer from his analysis of evolutionary practitioners is that 'science is special, and this is because of its standards; the critics were wrong in arguing otherwise. But it is also true that science is not special, and this is because of its culture'.

In other words, we need to be simultaneously careful and robust in arguing for our scientific results, whether we are evolutionary biologists, sub-atomic physicists, or biogeochemists. Notwithstanding this, Ruse has advanced the debate about the nature of science and particularly about the state of evolutionary science. His book is very readable. The descriptions of scientists at work, and their motives and standards, are compelling. He destroys the castle of cards which proclaims that evolution is 'only a theory'. I hope it will be read widely by Christians so that we can put away old arguments over the innate weakness of evolutionary science and move on to much more important questions about God and Creation, and his will for us as his vicegerents.

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Freeman Dyson

Origins of Life, Second Edition

Cambridge University Press, 1999.
99 pp. pb. £6.95; US$12.95.
ISBN 0-521-62668-4

It is pleasant to be able to review a book by the winner of the 2000 Templeton Prize.

Freeman Dyson tells us that life originated when proto-cells started synthesising proteins. He gives us detailed arguments in favour of this hypothesis, which is a development of the theory that the Russian scientist Oparin put forward at the beginning of the 20th century. Freeman Dyson is well aware that his is a minority view: most scientists interested in the origins of life believe that the replication of nucleic acids preceded protein synthesis. But he presents his arguments so persuasively and so logically that we accept that his case is a strong one.

Professor Dyson has found no reason to change his views since the publication of the first edition of his book in 1985. Clearly, they have been minutely discussed but they cannot, at this stage, be refuted. The second edition of the book is unchanged in essentials; it consists of the same four chapters as the first, though each has been slightly expanded. The author has incorporated new material concerning discoveries made since the first edition appeared. These are three in number. First, it now appears that, contrary to what had been thought, the primitive earth probably did not have a reducing atmosphere. Secondly, life may have originated in a 'hot, deep, dark, little hole on the ocean floor' where the atmosphere is reducing (thus enabling synthesis of aminoacids); anaerobic thermophilic bacteria thought to be the most primitive organisms to exist have been isolated from such hot spots under the ocean floor. Thirdly, the known date of living organisms has been pushed back to 3800 million years ago. This has been made possible by the finding that some carbon thirteen isotope found in certain ancient rocks in Greenland has been depleted to a degree characteristic of biologically-processed carbon.

What does Freeman Dyson mean by 'life'? He does not give any clear definition, and it is not until nearly the end of the book that one finds the statement: 'The essence of life from the beginning

was homeostasis based on a complicated web of molecular structures' (89). Or in other words: life is what keeps itself going by its own powers. We are left wondering what life is. That sent me back to Schrodinger's book 'What is Life?', the inspiration for Freeman Dyson's 'Origins of Life.' Schrodinger writes: 'How can the events in space and time which take place within the spatial boundary of a living organism be accounted for by physics and chemistry?' If we assume that the laws of physics and chemistry, together with the emergent properties of ever-more-complex structures, are sufficient to account for the essence of life, we are obliged to conclude that scientists are little better able to understand life than they were in 1942 when Schrodinger first published his book. The lack of understanding is due to the complexities of the processes involved and to their great age, but also because the term 'life' is itself so full of mystery, so rich in human, emotional and religious associations, that its reduction to physics and chemistry risks misleading the reader. However, Professor Dyson's statement at the Templeton Prize News Conference makes it clear that he is well aware that modern scientists and theologians have not solved the mysteries of life.

Freeman Dyson writes that he is 'guided by a personal philosophy that considers the primal characteristics of life to be homeostasis rather than replication, diversity rather than uniformity, the flexibility of the genome rather than the tyranny of the gene, the error tolerance of the whole rather than the precision of the parts' (90). He does not see human beings as the prisoners of their genes, but as beings whose brains are shaped by genes and the environment and partly by random forces. The implications of these ideas, experimental and religious, are left to others.

Margaret Ginzburg retired recently as an Associate Professor of the Institute of Life Sciences, The Hebrew University of Jerusalem.

J. Wentzel van Huyssteen

The Shaping of Rationality: Towards Interdisciplinarity in Theology and Science

Grand Rapids, Mich: Eerdmans, 1999.
303 pp. hb. £22.99. ISBN 0-8028-3868-5

Many have argued for rationality as a defining characteristic of human beings. In this book Wentzel van Huyssteen sets out to explore the ubiquity of rationality in diverse fields of human discourse and offers a model which attempts to move beyond the debate between modernity and postmodernity. The foundationalism in epistemology which characterises the modernist programme is found wanting. The postmodern critique has exposed the inherent inadequacies of foundationalism. There are no certain starting points which we can all agree upon. In turn, the nonfoundationalist alternatives offered by many postmodern thinkers are also unsatisfactory. They lead to a relativisation of knowledge claims that fails to adequately account for the remarkable successes of science in particular, which offers insights into the workings of the world that seems to have universal applicability. At the same time, we need to take seriously the way in which communities generate and function with particular paradigms of understanding, in theology as well as in science, and recognise the fallibilist nature of all of our rational enterprises. What van Huyssteen does in this important book is to show how the space left by modernism and postmodernism allows for an epistemological framework that takes seriously the strengths of both, without capitulating to the limitations of either. This approach he labels postfoundationalism.

The book is a careful and patient development of this basic thesis: that the problem of rationality holds the key to exploring the relationship between the plural forms of discourse that are constitutive of the whole of human experience, including disciplines as diverse as those of theology and science. In the first section on Rationality and the Postmodern challenge in

Science, he rightly rejects the marginalisation of theology that is characteristic of modernist construals of science as the only acceptable model of rational activity. Along with Lyotard, he sees postmodernity operating within the discourse of modernity, relentlessly interrogating its foundationalist mentality, the 'darker side' of modernity. This is a helpful acknowledgement of the breakdown in the traditional barriers between the natural sciences and other reasoned strategies. We must take seriously the sociohistorical location of all thinkers, who operate within traditions as interpreters of experiences.

Section two develops the discussion of Rationality and Nonfoundationalism in Theology. The author is not a neo-Wittgensteinian, happy to consign various theologies to impregnable fideistic worlds. This would result in complete epistemic relativism. This is not the way to escape the critique of foundationalism in theology. But we must acknowledge that a given theology has a hard core of beliefs that are in practice highly resistant to falsification, effectively functioning as foundations. Here van Huyssteen used the insights of Nancey Murphy and others who have explored Lakatos' philosophy of science with its notion of protective belts surrounding the core of theories whilst allowing for discussion of fallibilist aspects of the working model. Key questions arise here as to the epistemic status of ultimate religious commitments. What if anything is non-negotiable in the discussion between differing theologies and between theology and science? The argument here is that we do in fact share the rich resources of human rationality which allow us to enter into discussions between people with widely divergent beliefs and commitments. Tribalism is not necessary and science is not a privileged cultural or epistemological domain.

The third section looks directly at the nature of rationality itself and the notion of Postfoundationalism. He quotes Calvin Schrag with approval in declaring that postmodernity has not offered any positive perspective on rationality. At the heart of human rationality is an unending quest for intelligibility. It is a pragmatic enterprise, taking place in living communities with evolving traditions of understanding of the variform character of our experience of everything. The postfoundationalist view of rationality aims to capture those features of scientific reflection that theoretically make it a paradigmatic rational enterprise without, however, falling back onto the totalising foundationalism of the classical view of rationality. We are not calling into question scientific rationality as such. We are questioning any imperialist claims made on its behalf which are constitutive of what is pejoratively labelled scientism. Postfoundationalism offers a third way beyond the overdetermination of theoretical reason embedded in modernism and the dissolution of the rational agent in much deconstructive postmodern thought. Respecting the rich and diverse resources of rationality allows for interdisciplinary dialogue without one camp dismissing the legitimacy of the other with respect to rationality. This allows for the legitimation of our rational judgements which are all about finding experientially adequate strategies, even when they are as different as science and theology.

Thus the fourth section examines Rationality and Experience. We attune our beliefs, personal convictions and critical evaluations to the overall pattern of our experience. There are overlaps between the reasoning strategies of science and religion. They differ in their emphasis on the epistemic scope, experiential resources and heuristic structures. But both are concerned with what we see as real aspects of our experience. The distinguishing feature of religious experience is not found in its subjective nature, but in the individual's rational judgement that religious experiences can only be accounted for in religious terms.

Finally van Huyssteen turns his attention to the issue of Rationality and Pluralism. He rejects the rigorous demarcation of science and religion that underpin the now classical models of the relationship between the two, as with Barbour's typology of conflict, dialogue, independence or integration. We have to abandon attempts to unify and integrate all our discourses under one epistemology. Instead we have to recognise the diverse domains in which we use rationality to make sense of our experiences. Then we can engage in respectful dialogue, teasing out similarities and differences without covertly asserting the a priori superiority of any one position. At the same time, we must avoid being fideistic prisoners of our own traditions. We must be open to the possibility of revising our views in the light of our conversations. Living research traditions have good reasons for where they are, be it a theological or scientific tradition or programme. This search for meaning and intelligibility is based on more than cognitive resources, and evolves over time. The actual practice of a community is embedded in its life and faith. Relentless self-criticism and a pragmatic evaluation of our understanding characterises healthy communities. We will not jettison deeply held convictions easily, but an openness to change our views in dialogue with others is a sine qua non of the postfoundationalist approach. In interdisciplinary reflection and dialogue this should enrich our holistic understanding of the multiform reality in which we find ourselves. This is the search for an integrative, non-totalising model of human knowledge that is the theme of this book. This can be our shared concern in the ongoing dialogue. We can simultaneously affirm our diverse traditions without capitulating to a non-critical and superficial, unquestioning conversation between disciplines and traditions. We can be challenged and challenging and hopefully discover thereby what may be consistent with or complementary to the Christian or any other worldview.

This is a scholarly text which is essential reading for those concerned with the postmodern context within which we debate the relationship between science and religion. It points to a way forward beyond the impasse that the postmodern critique of both theology and science appears to have left us in. It offers a defence of rationality that is positive and plausible and allows us to avoid the dangers of both foundationalism and relativism. Wentzel van Huyssteen has a profound understanding of these issues and I for one am indebted to him for this fine book.

Adrian Brown took time out as a Farmington Fellow in Oxford to examine the tension between scientism and postmodernism before returning to teaching religious studies and philosophy at the Ecclesbourne School in Duffield.

Steve Jones

Almost Like a Whale: The Origin of Species Updated

London: Doubleday, 1999. 402 pp., hb. £20. ISBN 0385 409850

Steve Jones leaves us in no doubt of his admiration for Charles Darwin. 'Darwin's theory of common descent does for Biology what Galileo did for the planets. It was laid out in a book written for the general reader, the only best seller to change man's conception of himself. An idea put forward in 1859 is still the cement that binds the marvellous discoveries of today. *The Origin of Species* is without doubt the book of the millenium' (xviii). Many scientists, especially those in the Biological Sciences, would not disagree with him, although some might venture to suggest that another best seller, the Bible, has also had a major influence of man's conception of himself! What makes *The Origin of Species* the more remarkable is how much of what Darwin proposed has not only stood the test of time but also been greatly

strengthened by the subsequent advances in scientific knowledge. It was with this in mind that Steve Jones decided to compile a modern version of the original, using Darwin's own chapter headings and summaries, whilst incorporating the most recent scientific discoveries to support the hypothesis.

Jones notes that '*The Origin* is the high point of literature as fact. Darwin wrote well because he read well' (xx). It is clear that in their writing skills, the two share something in common. Jones too has read well and is a master communicator, bringing together a rich tapestry of scientific facts in a readily accessible form full of humour and anecdotes. It is a book that can be appreciated by the educated lay person, yet remains informative for the specialist. However, entertaining though the author's style may be, he does sometimes get carried away with his own eloquence and the reader may feel that the book is considerably longer than it need be.

Jones begins by setting out his reasons for writing this book in the context of a brief historical overview of how Darwin himself came to write *The Origin*. He then moves into an introductory chapter in which he describes how the emergence of the AIDS virus in its numerous variant forms provides an excellent example in miniature of many of the key mechanisms that drive the evolutionary process: the struggle for existence, the action of natural selection, its geographical spread and descent with modification. In subsequent chapters, using Darwin's own headings, Jones skilfully presents the wealth of contemporary evidence to support Darwin's thinking on the evolutionary process. He discusses variation under domestication; variation under nature; struggle for existence; natural selection; laws of variation; difficulties of theory; instinct; hybridism; the imperfection of the geological record; the geological succession of organic beings; geographical distribution; morphology, embryology and rudimentary organs.

Following the format of *The Origins* as closely as it does, *Almost Like a Whale* certainly helps the reader to appreciate the remarkable insight and genius of Darwin. It also provides a helpful framework around which to organise the immense body of evidence for evolution drawn from many disciplines. But there are draw-backs. First, there are times when the same evidence is reviewed in a different context, which adds to the length of the book. Second, Jones incorporates the compelling evidence that comes from more recent advances in molecular biology within the different chapters rather than as a separate entity. Whilst this has the advantage of coherence, for those not versed in the language of molecular biology the force of the arguments derived from protein and nucleic acid structure may not be appreciated. Nor does it do justice to the controversies that these new data bring. As a recent report in Nature noted, 'Evolutionary trees constructed by studying biological molecules often don't resemble those drawn up from morphology' (Trisha Gura, 'Bones, molecules…or both?', *Nature* 406:230-233, 2000).

Jones is not afraid to make the occasional derogatory comment about 'creationist science', although he does not do so with the same venom displayed by some authors. However, he like many others does not appear to appreciate the distinction between creationism and the argument for design in the evolutionary process. Many of the popular writers on evolution such as Richard Dawkins actively ridicule the design argument, yet its credibility is becoming recognised by an increasing number, aided by books such as *Darwin's Black Box* by Michael Behe. It is a pity that Jones does not engage more fully in this debate. Whilst many readers of this journal would see some of Behe's arguments as a return to 'God of the Gaps' reasoning, he does raise important issues that I for one would like to have seen Jones address. There remains an important distinction between identifying the evidence for an evolution-

ary process at the molecular level and establishing what is responsible for driving the process forward. It is likely that we will continue to understand more and more fully the mechanisms involved, but this does not allow us to dismiss the possibility that a designer might be at work guiding and directing the process. Even within Jones' own writing there are unintentional allusions to purpose or design, although he would presumably argue that these are used only as literary devices. Thus he says of the sacrifice of soldier ants that 'As a soldier shares all its genes with those it guards, *it makes perfect sense* for it to be sacrificed if, by so doing, it increases the chances of its sibs' (173). Perfect sense to whom and by what molecular mechanism is this achieved? And elsewhere 'Many animals assess the genetic cost of a slaughter of the innocents' (188).

Few readers of this journal would wish to disagree with Jones' firm conviction that humankind is profoundly different from the rest of the animal kingdom. 'When it comes to what makes us different from other creatures, science can answer all the questions except the interesting ones. The human intellect stands alone.' (351). Nor would many of us take issue with his lack of sympathy for those who seek to move the theory of evolution from the biological to the sociological arena. 'Evolution is to the social sciences as statues are to birds: a convenient platform upon which to deposit badly digested ideas …Biology tells us that we evolved, but when it comes to what makes us human is largely beside the point.' (xxvii).

In summary, this is an entertaining and very readable book that provides a comprehensive and contemporary account of the evidence for evolution. Although rather long, there will be few who read it and do not feel enlightened in some way. Unlike several books of its kind, it avoids making too many unnecessary attacks on those who believe in a creator God. For those of us who do hold such views, this book will help us to recognise afresh the awesome creative genius of our God as we 'think God's thoughts after him'.

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Audrey R. Chapman

Unprecedented Choices: Religious Ethics at the Frontiers of Genetic Science

Minneapolis: Fortress Press, 1999;
pp ix + 261; pb. £14.99, $22.00.
ISBN 0-8006-3181-1

I am writing this review in the days following the rather premature announcement that the sequencing of the human genome is complete. I cannot recall any other scientific announcement to which so much newsprint or broadcast time was devoted. Certainly the cloning of Dolly in 1997 was very newsworthy and generated a lot of comment, much of it hostile. However, with the human genome project we saw the serious newspapers devoting pages and pages to the item, ranging from analysis of the science through potential medical applications to social and ethical issues. There is clearly something about human genetics that strikes a chord with many people. There is certainly a perception, not in my view justified, that our understanding of the nature of humankind has just undergone a paradigm shift. Thus James Watson, the first director of the human genome project, states that the information will enable us to know who we really are, a statement that has an almost theological ring to it. There is also the rather more well-founded perception that detailed knowledge of human genetics, combined with other advances in biomedical science, will enable us to manipulate the lives of other humans in ways that have not been previously possible. Some of these potential manipulations are social, including discrimination in the areas of employment and insurance, whilst others are physical, including possibilities for gene therapy

and for genetic enhancement. In my undergraduate Bioethics course I argue that modern biomedical science has not thrown up any new generic ethical problems. Nevertheless, the potential for misuse of biomedical knowledge has led to very new situations for the application of established principles. We have power that we did not have before. It is this situation that led Audrey Chapman to call her book *Unprecedented Choices*.

Dr Chapman is an ordained Christian minister and also Director of the Programme of Dialogue on Science, Religion and Ethics at the American Association for the Advancement of Science. It is her thesis in this book that society needs to hear a religious perspective on modern biomedical science: there is a spiritual dimension to consider. She uses the word 'religious' rather than Christian because she recognises that other religions may have a position on these issues. However, in practice, the book is mostly written from a Christian standpoint and mainly deals with the debate amongst Christian churches and organisations. So, the book is not a discussion of the issues from the standpoint of an individual Christian but is a survey and critical review of what individuals and organisations (including churches) have written, from a religious standpoint, about those issues.

The book is divided into six chapters. In the first, *The Framework*, the author sets the scene with sections entitled 'The Genetic Revolution and its Implications', 'Making Unprecedented Choices', 'The Potential Role of Religious Communities', and 'Towards a Dialogue between Genetic Science, Theology and Ethics'. Then follow three chapters in which the religious responses to The New Genetics, to Cloning and to the Patenting of Life are reviewed. Chapter five is entitled *Theological Reflections on Genetics and Human Nature* and deals with those difficult questions of spirituality, free-will, freedom, determinism and sin in relation to genetics. The final chapter is an overview dealing with both the positive contributions that can be made by 'religious ethics' and the limitations thereof.

Although Dr Chapman is careful to state that she is not presenting her own views on the issues, she nevertheless sets out the questions that should be addressed. She does this in a clear, perceptive and challenging way and in doing so defines the agenda for the religious and religious-ethical debate. Throughout the book there is the clear theme that she believes debate amongst the religious communities to have been inadequate (although she does highlight some welcome exceptions). Some individual religious ethicists have ducked the issue by writing from a secular viewpoint whilst some specifically religious writing has been too superficial or has failed to identify the key questions. However, she does recognise that there are problems. Theologians and religious ethicists may not know or understand the science well enough to debate its implications, although her own knowledge of science is impressive; well-meaning scientists who have a religious faith may well not have adequate theological or philosophical knowledge to make a useful contribution (I shift uneasily in my chair as I type these words!). There must therefore be dialogue that embraces the scientific and religious communities (including those who count themselves members of both). Even then however, there will be difficulties. Within the adherents of one religion (and let us focus on Christianity here) there may well not be agreement on these unprecedented choices. However, Dr Chapman will not take this as an excuse for failing to join the debate. In the chapter on cloning she quotes Ronald Cole-Turner: 'There is something worse than theological disagreement and that is theological silence,' a comment that could be applied to all the major issues dealt with in this book. Let us hope the Christian church can rise to this challenge.

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David E. Newton
From Global Warming to Dolly the Sheep: An Encyclopædia of Social Issues in Science and Technology
Santa Barbara/Denver/Oxford: ABC-CLIO, 1999. 296 pp. pb. £14.99.
ISBN 1-85109-341-9

This slim volume takes on a bold task, namely to discuss about a hundred areas of science and technology with a focus on environmental issues and the latest biological technologies. Newton deliberately excludes discussion of broader environmental questions, such as global warming, addressed elsewhere. His aim is to give a brief synopsis of the background, history and social/economic/political/religious and ethical issues raised by each of the areas under discussion. The book is written in an accessible style and is oriented almost exclusively towards the American market. As one might have expected, an encyclopaedia compiled by one author is a very difficult task and sadly the quality of the volume suffers as a result.

The selection of entries considered important, while not arbitrary, lacks consistency in approach and there does not always seem to be a clear rationale. For example, there is a heavy emphasis on topics such as drug abuse, nuclear issues of all kinds, behavioural genetics, medical psychology, alongside discussion of particular chemicals that cause pollution, such as cyclamates and de-icing of roads. The entries themselves are very uneven in their treatment. There seems to be no reason as to why some species near extinction are chosen over others, except perhaps that they have reached the popular press in the USA. Moreover, there is only one entry under K, for example, namely Kennewick man, a skeleton found in the Pacific north west USA in 1996! Of more concern, perhaps, is the fact that the social issues are discussed in a superficial way throughout the book. Usually this takes the form of presenting a case for the science, then raising social issues by way of a critique of the processes, for example, objections to the chemical castration of sex offenders. The tendency to present social issues in a similar style to scientific facts betrays a certain naivety in dealing with complex social and political questions.

The religious issues, where mentioned, are dealt with in a cursory and superficial manner. For example, in the discussion of animal rights/welfare particular religious concerns are not addressed and the alternative approaches are presented as factual arguments. The discussion about conservation of the environment presents only one religious position, namely the 'biblical mandate' (46) to use resources for human benefit. Hence, the treatment of the religious aspects of this issue and the theological alternatives are not covered. The long section on creationism reflects the American bias of the book. For the entry on human gene therapy the religious issues are again dealt with in a superficial way, raising the simple question of whether humans are acting 'like God' (136). However, religious concerns are not mentioned in connection with genetic testing or the human genome project. While there is a fairly long section on abortion as a separate entry, this is presented in terms of the legal issues, rather than the religious questions. The AIDS entry merely mentions the idea that AIDS is 'God's punishment' for homosexual activity (125). The science and religion section is positively painful to read, with religion stereotyped as based on faith in a book or 'superior person' (251) and the conflict model as normative. Throughout the book the 'God factor' seems to be introduced as a block to science.

The genetically modified food debate is presented in terms of benefits and risks, with no attempt to define or delineate the underlying philosophical and ethical questions at stake. Again, the case is presented for the use of such food, followed by objections from critics. The ethical issues discussed in connection with genetic testing are also dealt with in a

superficial way. For the human genome project, ethical issues are just stated as being 'complex', without any real discussion of the alternatives. It seems that the ethical issues, where they are discussed, come from more journalistic sources, rather than being based in academic knowledge of the subject matter to hand. This makes the text easy to read, but its usefulness is limited by the cursory treatment of the social issues it aims to address.

While this book may give students some ideas about issues that are currently becoming important, such as privacy and the internet, it is not so much an encyclopaedia, as a popular summary of certain facts connected with the particular technologies under discussion.

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Andrew Barton
Questions of Science: Exploring the interaction between science and faith
Eastbourne, Kingsway Publications, 1999. 319 pp. pb. £8.99.
ISBN 0-85476-779-7

Question and answer apologetic for Science and Faith is in the fashion at present; *God for the 21st Century* (ed. Russell Stannard, SPCK), published this year, covers somewhat similar ground to this book. But whereas there the answers are given by a range of distinguished scientists and thinkers, here Andrew Barton has posed all the questions, and attempted all the answers.

One snag of this approach is that the questions posed may not be the ones that really seem to demand answers, and this is particularly so where the questions are as detailed as Barton usually presents them. Time and again I found myself irritated by the internal dissonance of the questions, and then being led into an answer which (though it might make excellent points) did not really answer the set question. An example may help to illustrate: q. 34 asks, 'Our conscious thoughts are the product of brain chemistry, so are they not merely subjective illusions?' What intelligent person would ask this question? Surely, if thoughts are the product of brain chemistry, they must have objective existence – as electrochemical neurological events; what is much more significant is 'what is the relationship between such events and our subjective awareness?', or 'does such an electrochemical explanation falsify our impression that we have the ability to control our thoughts?' In answer to this question (or, possibly in answer rather to the questions I have suggested), Barton makes some good points about reductionism – but oddly fails to point out the real knockout argument against mechanistic neurological explanations, namely that they eliminate the answerer as a valid witness.

Andrew Barton is a physicist, but his questions range widely across the sciences, and sometimes beyond (for instance, q. 36 is not really scientific, but rather a form of the old chestnut about rejecting God because the world is so bad). Generally he displays a good grasp of different disciplines, and has clearly read widely, and quotes other sources frequently; his glossary of scientific and philosophical terms is also valuable. Some of his answers I found very helpful – for instance, to q. 32 on Freud – and, not surprisingly, he is perhaps strongest where dealing with physical and cosmological issues. His philosophical arguments tend to be simplistic; and he is at his weakest over biological issues. Some simple errors occur here: amino-acids are not the components of DNA (127); and his presentation of Darwinian and Neo-Darwinian explanations fails at several points. Q. 23 (Aren't we the products of a 'mindless' evolution that Darwin discovered?) is not well answered: the writing flits from historical survey to refutation and back, without a coherent theme, and

the role of chance and selection in Neo-Darwinism is not well understood. The attempt to interweave selection and divine action is unconvincing, and leads to statements such as this: 'Randomness is part of the divine means, a tool for exploring within the whole creation, for which a directed purpose readily explains how the beauty and complexity of life arose.' This strikes me as near gobbledegook. It is not surprising, then, that the old problem of explaining from a Darwinian viewpoint the evolution of the mammalian eye is not well described; this is not a question about how the many small component steps could have come together to from a functional eye in the absence of a designer, but rather about whether the steps would individually have given enough advantage to survive while others were added. Barton quotes approvingly the biochemist Behe's analogy of the mousetrap – you can't evolve a mousetrap (all the components must work exactly right, or nothing does), you can only design it. But Neo-Darwinians would argue that what evolved initially had no mousetrap intentions – perhaps just a springboard – and mouse-trapping arose serendipitously and was then improved.

Some aspects of the book make it difficult to see exactly for what kind of reader it is designed. On a small practical point, the index at the beginning does not list the individual questions, only the seven main sections, and so it is difficult to see without wading through whether a desired topic is covered. Also the answers generally assume a biblical Christian framework for their faith aspect. This means one would not be confident in presenting the answers to a non-Christian enquirer or sceptic. Statements which begin 'God is….' invite the retort from such, 'How do you know this about God?' For them, the reasonableness and power of a biblical account needs a more objective and less presumptive introduction than is sometimes given here. However, for Christians wanting a compendium of thoughtful answers, or at least partial answers, on a wide range of troublesome issues, there is much that is valuable.

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Richard Harvey Brown

Towards a Democratic Science. Scientific Narration and Civic Communication.

New Haven, CT: Yale University Press, 1998. 283 pp. hb. $35.00.
ISBN 0-300-06707-0.

Brown, an American based sociologist, has thought hard and provocatively about questions of science and values in modern/post-modern societies. Much of the material in this book has emerged from conference presentations and published papers dating from the late eighties onwards. It is thus well honed. At the same time, although attempts are made to link the chapters, I think they can be read as individual essays. No doubt they are intended to have a cumulative effect on the reader, especially given the author's pre-occupation with rhetoric in social life and in science. This is a demanding book which takes us over difficult intellectual terrain, much of it interdisciplinary. But the journey is worthwhile and even at times exhilarating.

Fortunately for the traveller, who might become confused or even lost from time to time, signposts are offered at the outset in the form of questions. 'How might public space be reclaimed from scientistic experts and irrational storytellers and expanded for citizen self-direction ? How can we redeem science from absolutist pretensions of positivist ideologues on the one hand, and liberate it from the political and economic opportunism of the corporate state on the other? How can we move beyond the naïve or cynical technicism of positive planners and the sterile moralism or implicit nihilism of their romantic or reactionary critics? What is the role in

such a project for narratives of scientific and ethical traditions? How can more embracing narratives be created that subsume scientific-technical knowledge within a broader reasoned ethical public life?' (x-xi) How indeed! Here is a writer who, at least in the way he formulates his questions, wears his values on his sleeve. Again it underlines his view about the role of rhetoric in society, a view which is explicitly influenced by Aristotle.

'It's the way they tell them', we sometimes say about good comedians. Brown wants us to think about story telling as something which is intrinsic to scientific work. In the field of fiction this is clearly so. Again, in, say, social anthropology we can see how fieldwork data has to be organised into an account. In the natural sciences it is less obviously so but Brown urges us to consider the literary text work that under-girds and infuses theories and descriptions. To do so, in his view, is not to undermine scientific activity but to guard against the tendency of science becoming captive to ideological preconceptions. It is also to recognise explicitly that language is not a neutral carrier of meanings. So, for Brown, 'the ways we talk about the world become as important as the objects of the worlds that, when we talk about them, become what we experience' (63). I think I would want to say almost as important since reality can break in upon us whether or not we have adequate concepts to describe it. Not everyone may have a concept of famine or an understanding of its causes but it will not prevent them from starving. Still, Brown has important things to say about the ways in which narratives in science are struggled over and the significance of narratives of conversion, which have to do with the ways discoveries are encoded and presented. This is what scientists actually do and, argues Brown, at its best this represents an open-ended quest for truth. So this is not a position of anchorless relativism nor is it a cultural studies style attack on science itself.

But who tells the stories and in what are they embedded? This takes Brown into the political economy of science, essentially the complex matter of the relation between scientific knowledge and political power. The institutionalisation of science, the relationship to commercial and political interests, the links between science and technology, the funding arrangements for science form a knot which, if we are to understand what is going on in our contemporary world, needs to be unravelled. This is why Brown poses the question: 'How can one simultaneously maintain both the cognitive legitimacy and autonomy of science and the instrumental utility of science to the elites upon whom the institutional practices of science and the privileges of scientists depend?' (148). Or, put differently, we might ask: who is controlling who and for what purposes? Is it the scientific 'experts' who tell us, the public, what is to be done? And what makes them experts in what domain? Are scientists simply the servants of power? Is it the politicians who are selective in their choice of 'experts'? Is it corporate capital who buy in the scientists to work on their business agendas? Anybody who has followed public controversies in relation to BSE will know that it can all be very messy and unsatisfactory.

It is to Brown's credit that he seeks to address what he perceives as the democratic deficit in science and in the wider society. The concept of citizenship is crucial here. It is through an informed and participatory citizenry that we can have a more open political process. But scientific institutions and the decisions they embody need to be de-mystified and more transparent. Brown illustrates the possibilities by reference to environmental and ecological movements in the USA. The argument is that people in communities with particular problems that are affecting their health, issues of pollution or contamination for example, can, within an environmental justice movement, develop a community-based scientific method. The scientist as omnipotent technical expert has to be superseded by

the scientist as facilitator. Local knowledge may not be the ultimate criterion of what is the case but it should not be ignored. Questions of value are re-situated and made more explicit: 'People's science empowers local citizens by subsuming scientific rationality within a larger civic intelligence. One of the first steps in developing a local scientific capacity is the pooling of common knowledge about the particular situation. Much as the scientific community learns by integrating diffuse data, citizens combine their knowledge to form a pool of local expertise' (210). If science in particular and the social world in general are humanly authored then the beginning of wisdom is to work through the implications of that. For Brown, the name of that wisdom is prudence.

Yet in a world of fragmentation, conflicts of interest and difference is it possible to create a polity where these can be held together sufficiently to create a shared moral world? Brown recognises the utopian strain in claiming that it is through the medium of reasoned ethical narration. For him 'if peace and justice are to be pursued and the rights of particular groups protected…these ethical commitments must be justified in terms of the larger narrative of democratic society' (223). In theological terms this is one way of saying that we should not give up hope on the human project. There is a pleasing irony that at a time when post-modernists proclaim the death of grand narrative, we should be offered what is almost a meditation on the recovery of such a narrative. It may be helpful to quote from the final paragraph of the book to indicate where the journey has taken us: 'Between the utopian need to create our history and the actuality of our historical disillusion lies the openness of narrative desire. This openness is a wound that precedes desire. It provides not fulfilment but the advent of our hope' (226).

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William A. Dembski

Intelligent Design: The Bridge Between Science & Theology

Downers Grove, Ill: InterVarsity Press, 1999. 312 pp. hb. $19.99.
ISBN 0-8308-1815-3

William Dembski is a leading proponent of the concept of 'intelligent design' (ID). In his earlier, more technical, book *The Design Inference* (reviewed in *S&CB* 12.2, 2000) he sought to put the concept on a theoretical and statistical basis. The centre section (Part 2) of this book is a much more popular presentation of that work. It is prefaced (Part 1) by an attempt to justify ID in three ways. The first is by relating it to 'biblical signs', the second is a defence of the concept of 'miracle' as an event that does not fit into the normal 'system of nature', and the third a defence of the inclusion of 'intelligent causes' in natural theology. Part 3 of the book suggests how ID might be a bridge between science and theology.

Since the statistical aspect of ID was discussed in the review of Dembski's earlier book by someone with far better credentials to do so than this reviewer, it will not be discussed here. However, even if we accept that the statistical basis is sound, there is still the practical problem of how the calculations of the probability of a system arising by chance are to be made when faced with a complex system. One of the few examples of this to which Dembski refers is the attempt to calculate the probability of a large protein coming into existence by chance that was reported at a Wistar Symposium in 1966. However, that calculation was badly flawed, partly because at that time little was known about the 3D structure of proteins. It was assumed that only one particular amino acid could be allowed at each place in the protein chain. However, with globular proteins there are large stretches where it seems that all that may matter is whether an amino acid is hydrophilic or hydrophobic. This greatly reduces the calculated improbability. There may be other factors, as yet

unknown, which may reduce the improbability yet further.

Dembski relies heavily on the work of Michael Behe, and seems unaware of the serious criticisms that have been made of it on scientific grounds. Like Behe he makes much of the concept of 'irreducible complexity'. 'A system is irreducibly complex if it consists of several interrelated parts so that removing even one part completely destroys the system's function' (147). The claim that such systems could not arise by a gradual process is simply wrong. One can imagine a system (A) which carries out a certain function rather inefficiently. A part (B) is then added (perhaps by gene reduplication and mutation) which helps A be more efficient. It is not essential, but simply improves things. However, further modification may both improve the efficiency of A+B and make B essential to the working of the system. An irreducibly complex system has then arisen by a gradual process.

The opening chapter gives a false impression of a biblical basis for the book. None of the biblical 'signs' can be compared with the kind of instances of ID that might occur in the study of nature by scientists. The biblical signs were given to specific people who sought them, or had a specific job to do as God's messenger. They derived their meaning from a specific historical context. They did not require specialist knowledge of search techniques to discover them. In fact the attempt to justify the concept of ID by appeal to biblical 'signs' is an example of the misuse of Scripture as a mere 'pretext' on which an idea is hung rather than the proper use of it as a genuine 'text' from which valid biblical principles are derived and then applied.

The weakest section of the book is Part 3. In ch. 7 Dembski makes a major mistake when he claims that the Big Bang theory gives 'epistemic support' to the Christian doctrine of *creatio ex nihilo*. That doctrine has never been about either the 'time' or 'mode' of creation. It was formulated in response to both dualism and pantheism to express a biblical understanding of the ontological relationship between God and the world. There is no biblical or theological reason why God should not have created a 'steady state' universe of the type Hoyle proposed. We would not then be able to point to an observable 'beginning' in our time frame, but that is no problem. As Augustine of Hippo pointed out, we cannot say that God created the universe 'in time', only that he created it 'with time', since time as we know it is part of the created order. In fact the theological equivalent to the 'beginning' of time in the Big Bang model would be in the phenomenon of 'continuous creation' – which Hoyle did not 'explain' but simply assumed as a 'given' in his model.

Given Dembski's preference for a model of the history of life in which the Creator 'feeds in' information at various points rather than supplying it all in the initial conditions, it is surprising that he favours the Big Bang model for cosmology. In this model all the information is there at the beginning, whereas in the 'continuous creation' model it could be 'fed in' gradually in discrete bits during the history of the cosmos. Since he is happy with the Big Bang model one would have expected that, by analogy, he would be happy to accept the model of 'theistic evolution' which he rejects. As with the Big Bang model the evidence of ID would be in the overall process, not necessarily in any specific bits of it.

The discussion of the etymology of *logos* (228f) commits the very basic 'root fallacy' of which every elementary student of semantics is made aware. Unfortunately it is common in popular theology, promoted by careless use of the 'word study' approach to the Bible which James Barr exposed long ago so thoroughly in his book *The Semantics of Biblical Language* (OUP, 1961). The fact is that words mean what they mean in actual use and context. The etymology can be totally irrelevant, even misleading. There are plenty of examples in any language of

words coming to mean almost the opposite of what their etymology would suggest. The discussion of human language (229-233) shows no appreciation of the insights gained by a long history of grappling with the nature of language about God that has gone on in the Christian tradition. Dembski makes the amazing statement that, 'The concept of father is not an anthropomorphism, nor is it referring to God as father metaphorically' (231). If it is not metaphorical, how am I 'born' of God without a divine 'mother'? Is he proposing that 'God the Father' had physical intercourse with Mary to produce Jesus as 'the Son of God'? How can he go on to say that 'All instances of fatherhood reflect the fatherhood of God'? Tell that to a child who has been sexually abused by her father! In fact he flies in the face of much biblical language which says of God, 'like a father he …'. This is exactly the language of simile/metaphor. The Bible builds up our knowledge of God as father by drawing on aspects of our experience of human fatherhood. There is no 'unmediated' experience of God to which the Bible points to define what God as 'Father' means.

This book is worth reading for the fairly popular exposition of ID theory in Part 2. Unfortunately it misuses the Bible in its attempt to give the theory some biblical legitimacy and its attempt to use ID as a 'bridge' between science and theology fails because of its misunderstanding of the doctrine of *creatio ex nihilo* and of the semantics of theological discourse.

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Laurence W. Fagg

Electromagnetism and the Sacred

New York: Continuum, 1999. 144pp. pb. $24.95. ISBN 0-8264-1147-9

The author is a retired Professor of Nuclear Physics at the Catholic University in Washington, D.C. and also has a degree in Religious Studies. His main theme is that the electromagnetic interaction is the most appropriate of the four fundamental forces in nature to provide a meaningful *analogue* of the immanence of God in the world. In this way his book aims to illuminate the relationship between God and humanity on the one hand, and the natural world as God's creation on the other. As such it is a contribution to a more complete theory of nature.

After a brief Introduction, the work is divided into two sections. Part I gives a summary of contemporary physics for the lay person. It places the electromagnetic interaction (EMI) in the context of the other fundamental forces, describes classical electromagnetism and quantum electrodynamics, shows how the EMI is involved in so many aspects of life and natural phenomena and justifies the selection of EMI as the most appropriate analogue of God's immanence. Part II, entitled *Electromagnetism and Spirituality*, contains five chapters expanding on the analogy and it is in these that this book is significant.

In quantum electrodynamics (QED) the EMI is carried out by 'virtual' (that is, unobservable) photons, while electromagnetic radiation is quantized in 'real' photons, observed in the visible portion of the electromagnetic spectrum as light. By extension, Fagg uses the term 'light' for both virtual and real photons of any energy in his chapter 5 on 'Light'. Here he recalls the many historical references to light as a spiritual symbol, including those in the Old and New Testaments. In chapter 6, on 'Indwelling', the author supports the views of both Christian mystics, such as St Francis of Assisi and William Blake, and Eastern religious figures that within nature can be found a spiritual indwelling, which speaks to us of God's presence in His Creation.

Following these two review chapters, Fagg explores in detail in chapter 7, on 'Analogy', his proposal that the EMI is a

physical and helpful analogue of God's immanence. We constantly use analogies in our reasoning and thinking, where they help us in our understanding. Since Fagg has shown the universality of EMI in both living and inanimate matter, he finds it a valuable aid to his understanding of the spiritual nature of the world that we inhabit. In his words, 'both God's immanence and the EMI, each at its own level, possess the proportionately analogical properties of ubiquity, great range of intensity, invisibility and constancy'.

In the last two chapters Fagg sets his analogy in the contexts of theology and of modern cosmology respectively. However, these discourses are so brief that they add little to those familiar with the work of Polkinghorne or Peacocke on natural theology, or with Hawking's famous book.

In summary, this is a short, readable and informative book for students of science and religion. It can be warmly recommended to those who require an introduction to the classical and quantum theories of electromagnetism and hence of their importance in understanding the nature of both inanimate matter and living beings. Once the author's ideas of the universality of the EMI are understood, his conclusion that this represents the best analogue for God's immanence in the world may be convincing and so an aid to spiritual growth.

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Del Ratzsch

Science & its Limits: The Natural Sciences in Christian Perspective (2nd edition)

Illinois/ Leicester: InterVarsity Press, 2000. 191 pp. pb., £9.99. USA ISBN 0-8308-1580-5; UK ISBN 0-85111-466-0

This book was first published in 1986 under the title *Philosophy of Science*. I enjoyed reading it then and warmly commend it in this second edition as an introductory text in the philosophy of science, written from a Christian perspective. The first six chapters explore issues in the philosophy of science, updated to the turn of the millennium. The last four look in detail at the interplay between science and religious, specifically Christian, belief. A consideration of the 'intelligent design movement' introduces a frontier discussion in the debate.

The style of writing is clear and, in presenting arguments with which he does not agree, the writer articulates them fairly and robustly, with no 'straw men' in evidence.

There are a few minor points on which I wish to comment but these do not affect my overall recommendation of the book. In one or two places the book betrays its earlier origins by overlooking necessary updates. On page 70 the author comments, 'If we take science as producing real knowledge about an objective reality, as philosophers of science increasingly do' and then references, in support, a work by Suppe which is listed under 'Further Reading' as published in 1977. Other examples are found in a three book subsection of 'Further Reading', where Chalmers' *What Is This Thing Called Science* (1976) and Newton-Smith's *The Rationality of Science*, are cited, with the comment 'but I recommend the Newton-Smith'. However, in the preface to the second edition (1982) of Chalmers' book, Alan Chalmers explains how, as a result of responses to the first edition, he 'left chapters 1-8 virtually unchanged and … replaced the last four chapters by six entirely new ones'. The book is now in a third edition (1999), and the second and third edition revisions may be considered to make the book more 'recommendable'.

Frequently, there appears the form of words, 'some have argued', and generally there follows a reference to an exponent of that particular view; but several times I wanted to know who were key defenders of that particular position and looked in vain for a reference. Twice (22, 78) reference is made to 'inductive generaliza-

tions' that water boils at 100˚C. But surely this is a matter of definition, not observation. The upper fixed point on the Celsius scale is said to be 100˚C and is *defined* as the temperature of the steam from water boiling at standard atmospheric pressure (760mm Hg).

In chapter 10, which looks at different views of the interplay between science and religion, the important work of W.H. Austin, in his *The Relevance of Natural Science to Theology*, although now out of print would, perhaps, have been worth mentioning. Twice on p. 93 the term 'scientific method' is used. In view of the fact that the author has eloquently explained that there is no one scientific method, it might help to make the point stick if the term was avoided and replaced by something like 'the methods of science'.

A final section is entitled 'Speaking the Truth in Love' and is a sensitively written and, sadly, a necessary reminder about the spirit in which debates on matters where Christians differ should be conducted — 'though… and have not love, I am nothing'.

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The Bishop of Chelmsford et al

A Time to heal: A Contribution towards the Ministry of Healing

London: Church House Publishing, 2000. 412 pp. pb. £9.95.
ISBN 0-7151-3837-5

The Bishop of Chelmsford et al

A Time to Heal: The Development of Good Practice in the Healing Ministry: A Handbook

London: Church House Publishing, 2000. 58 pp. pb. £2.95.
ISBN 0-7151-3838-3

The book *A Time to Heal: A Contribution towards the Ministry of Healing* contains the Report of a Review Group of twelve persons set up by the House of Bishops of the Church of England under the chairmanship of the Right Revd John Perry, the Bishop of Chelmsford, with the following terms of reference:

'To assess the theological understanding and the state of the ministry of healing in the Church of England and to make recommendations as to its improved effectiveness, taking into account not only the activities of different groups within the Church but also of the ecumenical expression of this ministry' (xiv).

Although the Report is somewhat modestly subtitled 'a contribution', at 412 pages it is the most comprehensive Report ever published on Christian healing, which no one who is interested in the subject can afford to neglect.

It describes the Church's healing ministry as 'visionary, prophetic and dynamic' like the ministry of Christ himself (16). This ministry is part of the full gospel, 'the gospel preached with the hope of healing' (xviii). After a historical review of the healing ministry in the twentieth century, the Report summarises the teaching of Scripture and tradition on healing. It then considers the ministry of healing in the Church of England today and in other Churches, and draws attention to the important contribution made by the 1958 Report of the Church of England entitled *The Church's Ministry of Healing*. Subsequent chapters deal with the practice of the healing ministry in the parish including the holding of healing services, with ministry to the dying or bereaved and the relationship of the Church's ministry of healing to complementary medicine and alternative therapies.

Comprehensive and excellent as the Report is, it nevertheless has certain self-imposed limitations. First, it focuses primarily on the situation in England, and in the Church of England in particular. Second, according to Appendix 6 (383-384), the research carried out for the

report was confined to diocesan clergy together with hospital and prison chaplains. In other words, the Report is concerned with the non-medical part of the spectrum of healing and where it speaks of co-operation between the Church and 'professional health care' it refers principally to the work of hospital chaplains and social workers. Third, there is little mention of the contribution to the Church's ministry of healing made by Christian doctors and nurses in the course of their daily vocation (but see 91).

The Report, by specific reference or by implication, draws attention to four needs in the current situation in the healing ministry. First, the need for the involvement of the health care professions in the thought and practice of this ministry. In the case of the 1958 Report, this was done by inviting the British Medical Association to help in the preparation of that report by publishing their own Report entitled *Divine Healing and Cooperation between Doctors and Clergy* (1956). Second, the need for information on the extent to which the healing ministry is currently practised in Churches throughout the country. Third, the need for this ministry of healing to become part of the normal activity of the parish ministry. Fourth, the need for closer co-ordination of the practice of this ministry at both a local and a national level. In relation to national co-ordination, the Report suggests the formation of a new ecumenical Churches' Healing Ministry Group. This would revive the type of organisation which was set up in 1941 and ultimately called The Churches' Council for Health and Healing. This body was dissolved in December 1999 for lack of support by the Churches.

The recommendations of the Report total over 230 and occupy some forty pages (328-368). However, the Group is careful to say that 'it is not envisaged that all of the detailed recommendations could or should be put into place in the immediate future' (328).

It was a happy thought to summarise the findings and recommendations of the Report in a much shorter (and cheaper) form in the very useful and practical *Handbook* aimed at the development of good practice in the healing ministry.

The publication of this Report and the use of the Handbook based on its findings, should lead to a clearer understanding of the basis, nature and place of the healing ministry throughout the British Churches and a more effective ecumenical co-operation in its practice.

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R.J. Berry
The Care of Creation: Focusing Concern and Action.
Leicester: Inter-Varsity Press, 2000.
213pp. pb. £9.99. ISBN 0-85111-657-4

An Evangelical Declaration on the Care of Creation is the premier document to date issued by the Evangelical Environmental Network. This document attempts to set forth in unambiguous language several convictions consistent with both the Christian faith and the acknowledgement that human beings historically have mistreated creation and presently live ecologically unsustainable lifestyles. *The Declaration* is a significant step toward consensus among evangelicals with regard to a Christian perspective on environmental ethics. Indeed, the success of this endeavour is demonstrated by the endorsement received from hundreds of church leaders throughout the world. However, such trailblazing efforts are bound also to engender disputes over the relevant concerns, proper rank of emphases, and clichés or vagaries unwittingly drafted by document authors. The present book, *The Care of Creation: focusing concern and action*, is a commentary on these disputes.

The list of contributors is impressive: Richard Bauckham, Calvin B. DeWitt,

Susan Drake Emmerich, Timothy Dudley-Smith, Ron Elsdon, John Guillebaud, Peter Harris, John T. Houghton, Alister E. McGrath, I. Howard Marshall, Jürgen Moltmann, Michael S. Northcott, Oliver M.T. O'Donovan, Ghillean T. Prance, Stephan Rand, Ronald J. Sider, Howard J. Van Till, Loren Wilkinson, and Richard T. Wright. These contributions are supplemented with brief explanatory notes by editor R.J. Berry, a foreword by John Stott, and Lynn White's famous essay *The historical roots of our ecological crisis*. The full text of the *Declaration* is also printed (and also may be found on the Internet at http://homepages.tcp.co.uk /~carling/een/declarat.htm).

John Stott's endorsement of the declaration, as revealed in the foreword, is significant. It signifies perhaps that environmental concern is not merely the domain of counter-cultural idealists, Luddites, or adherents of new age spiritualism; rather, it is the onus of evangelical Christians. The essays vary in the significance of their content. Many of the ideas presented here may be found in other works by these authors (e.g. C.B. DeWitt. 1993. *Evangelical Review of Theology* 17:134-149; J. Moltmann. 1985. *God in Creation*, London: Collins; G.T. Prance 1996. *Earth under Threat*, Glasgow: Wild Goose). Nevertheless, it is not in presenting novel ideas that *The Care of Creation* is significant. Rather, this book brings together in succinct essays the principle components in the thinking of arguably the most influential thinkers in Christian environmental ethics.

This format of a compendium of commentaries permits the reader to ascertain the gist of several varying perspectives in a volume specifically designed to elicit dialogue. Note however, this is not an encyclopaedic treatment of the current debate. Most of these contributions assert a perspective and none too many lines are written in clear, analytic defence of a position. Likely, this is a weakness. A newcomer to the dialogue might form the impression that not enough concern is directed toward adequate (ecological/sociological/economic/philosophical/theological – choose your flavour) defence of Christian environmental ethics. (Such a newcomer might be correct; nevertheless, this is not the book upon which to make such a judgement.) There is a healthy bibliography to direct further investigations.

The Care of Creation, as a dialogue of critical analyses, contains essays primarily from theological and social perspectives. It seems to lack critical work from an ecological perspective (although scientists are certainly among the contributing authors). This is perhaps a tacit endorsement of the science upon which the declaration is based. Implicit in this concentration on theological and social issues, and explicit in several essays, is the suggestion that resolution of environmental concerns is primarily a social and religious issue. Science will inform our strategies for conservation and preservation. Theology, sociology, and philosophy will render meaning. *The Care of Creation* suggests many potentially helpful paths for exploration of these theological, sociological, and philosophical issues. It remains to be seen which of these paths will be most fruitful.

The *Declaration* was not a perfect document and its imperfections have opened a dialogue, partly transcribed in *The Care of Creation*. Perhaps it is in this that the *Declaration* is most valuable as a document, and *The Care of Creation* most beneficial as a commentary. For, such a lively dialogue cannot but invite new conversants to the discussion, challenge cliché, stimulate scholarship, increase general awareness of present environmental concerns, and 'stir up love and good works' in the realm of environmental concerns.

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David Wilkinson & Rob Frost
Thinking Clearly about God and Science

London: Monarch Books, 2000 (1996).
224 pp. pb. £7.99. ISBN 1-85424-485-X

Having two widely disparate authors write interleaving chapters is not the obvious way to create a popular book on science and faith. David Wilkinson is a Fellow of the Royal Astronomical Society whose research has included work on cosmology and on the death of the dinosaurs, who has been a Chaplain at Liverpool University and a local Methodist minister, and who is currently Fellow in Apologetics at St John's College, Durham. Rob Frost is a popular conference and convention speaker with 'a passion for Christian apologetics' and a doctorate on contemporary missiology, whose scientific qualifications do not extend as far as GCSE.

Their stated intention is 'to combat some very powerful myths … about the relationship of science and religion.' The book is decidedly popular in style, but they tackle all the familiar major questions which arise about the interaction of faith and science, and do not shirk relevant areas of history, philosophy and theology. After a joint introduction, the chapters are headed 'Can God Be Proved By Science?'. 'Isn't Science About Proof While Christianity Is About Faith?', 'Has Science All the Moral Answers?', 'Does Science Do Away with God the Creator?', 'Can You Believe in Miracles in a Scientific Universe?', and 'Can You Be a Scientist and a Christian?'.

Perhaps surprisingly, the book is very successful in conveying in a straightforward way many of the subtleties of the science / faith debate. It does not include any new arguments, but that is not its aim. What it does is to present material, almost all of which will be familiar to readers of this journal, in a much more accessible form than any other book I have read. There are numerous personal illustrations from the experience of the authors, and a large number of quotations from a wide range of sources, duly referenced. A considerable list of 'Further Reading' is provided, by no means all of it from Christian authors, and there is also an index.

The 'God' of the title is the Christian God, and it is clear that both authors are entirely orthodox in both science and religion, while avoiding being dogmatic in either area. In fact, care is taken to point out the limitations of both fields, and to recognise the arguments of those who think differently in either. From internal evidence one could never deduce Rob Frost's lack of formal qualifications in science – he has clearly read widely and effectively. All of the chapters are very easy reading, even racy at times, so that the book would be very suitable for someone who has little background in science, or theology, or both, but who has an interest in the subject matter. The importance of a personal belief in Christ is emphasised in several places.

It would be an ideal book for Christians who are scientists to buy, either to lend or as a source of ideas and quotations when seeking to explain why they consider there is no conflict between their faith and their science. It is also very good value.

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Peter D. Ward and Donald Brownlee
Rare Earth: why complex life is uncommon in the universe

New York: Copernicus (Springer-Verlag), 2000. xxvii+333pp. hb. £17.00/$27.50.
ISBN 0-387-98701-0

The thesis of this book is twofold: (a) it is probable that simple life (such as bacteria) is to be found in many extraterres-

trial locations; (b) it is highly *improbable* that complex animal and plant life forms resembling those that we have on Earth are to be found anywhere else in the universe.

The authors describe what they call the Astrobiology Revolution, which is currently being fuelled by the interaction of astronomy, biology, geology, genetics, palaeontology, and other branches of science. During the past quarter-century there have been many discoveries resulting from technical improvements in such fields as the dating of rocks, the analysis of DNA in fossils, and the study of the deep seabed, and there have been many new theories proposed to respond to the discoveries. The book gives a well-written account of these developments. It is enthusiastic about the progress in understanding that is being made, but sensibly cautious about the speculative nature of many of the suggestions that have emerged in the last ten years or so.

Does the book merit a mention in *Science and Christian Belief*? It has been praised by a number of leading contributors to the branches of science covered by the book; so the *Science* side is all right. What about the *Christian Belief* aspect? There is practically no mention of any religious belief at all, although there are four references to hell as a way of describing high temperatures (2, 20, 58 & 224)! Creationists are mentioned once, but that is in an aside about their citation of the (geologically) sudden appearance of fossils in the Cambrian rocks as evidence against evolution.

The theological stance of the authors can be deduced from the following quotation (36-37). 'Earth is actually the final product of an elaborate sequence of events that occurred over a time span of some 15 billion years, three times the age of Earth itself. Some of these events have predictable outcomes, whereas others are more chaotic, with the final outcome controlled by chance. The evolutionary path that led to life included element formation in the Big Bang and in stars, explosions of stars, formation of interstellar clouds, formation of the solar system, assembly of Earth, and the complex evolution of the planet's interior, surface, oceans, and atmosphere. If some god-like being could be given the opportunity to plan a sequence of events with the express goal of duplicating our 'Garden of Eden', that power would face a formidable task. With the best intentions, but limited by natural laws and materials, it is unlikely that Earth could ever be truly replicated. Too many processes in its formation involved sheer luck.'

Science is the human study of the physical universe; it is work to which valid contributions can be made by non-Christians and Christians alike. That being so, I am ready to accept the above quotation as a statement of the beliefs of the authors. But, as a believer in the Creator of the universe, I have reservations about their phrases 'controlled by chance' and 'sheer luck'. Assuming that the continuing work of astrobiologists will support the authors' thesis, which seems very likely to me, I am happy to accept their conclusion about the rarity of complex animal life in the universe, but I still believe that the ultimate reason for the existence and the fruitfulness of planet Earth is that the Creator has chosen to make it so.

I commend this book to anyone who would appreciate an overview of current thinking about the place of the human species in the physical universe. It gives a very readable presentation of current theories of the internal structure of planets (Earth in particular), of discoveries in palaeontology, of developments in biological classification, and of recent work in many other areas of observational science.

The structure of the book, which has no footnotes, draws the reader along. The index runs to17 pages and is helpful, but I was not so impressed by the references, which take up 27 pages. They are mostly to primary papers and are grouped by chapters, which leads to several repeats

of the same reference. I was surprised to find that some commendatory remarks in the text about particular books and essays were not accompanied by bibliographical details for the publications concerned in the references section. I detected only a few typographical errors, the most significant being on p. 25. In line 9 read '1964' for '1970' (see page 295 under Dole).

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Fraser Watts (editor)
Christians and Bioethics

London: SPCK 2000. 84pp pb £7.99
ISBN 0-281-05194-1

Human cloning. Genetically modified crops. Designer babies. Scarcely a month passes without some new biotechnological discovery hitting the headlines, inevitably accompanied by controversy; inevitable, because these novel technologies enable us to manipulate ourselves in the world in more fundamental ways than ever before. Our existing moral and ethical principles have not previously had to answer these new and disturbing questions.

The authors of this collection of short essays believe that Christianity can speak into this ethical vacuum by providing a coherent framework within which to address these issues – something which our pluralistic society lacks. The book itself is a write-up of a series of lectures organised in Cambridge by the editor, with the aim of enabling Christians to make a constructive and informed contribution to the bioethical debate. Accordingly, after an introductory chapter by Fraser Watts on the basics of secular ethical thought, each of the other five authors in turn tackles a hot topic with which they are personally concerned. All are experts and are professionally involved in the field about which they write, with the exception of John Polkinghorne, whose chapter on cloning is nevertheless very well researched. And all are deeply committed to their Christian faith.

Knowing its origin as a series of lectures aimed at a non-scientific audience, we might expect certain qualities from this book – accessibility, readability, and brevity – and indeed these things are all among its strengths. All the authors are clearly competent at communicating ideas in a concise and interesting way. Moreover, not only are the scientific and theological concepts presented, but also insights into the opinions of the general public and interested minorities. Any bioethical decision which ignored these would be doomed to failure in the real world. Of particular merit in this respect is Derek Burke's discussion of GM food, which should be compulsory basic reading for frustrated biotechnologists and concerned consumers alike.

However, the lecture series structure of the book also leads to some shortcomings. Of necessity each chapter cannot give a comprehensive analysis of its topic, but only a snapshot of some of the key issues or the barest overview of the subject matter. Therefore although the book will inform Christians not familiar with the bioethical discussion, they will need to do some further reading before they can really get involved in it. Furthermore, there is no overall thread running through the text; each chapter is very much a stand alone presentation, and moving between them involves dropping the train of thought one is being led along in order to pick up on that of each new author. Hardly a crime in a publication of this nature, but as several of the chapters overlap in their concerns, it is a shame that the various ideas presented are not brought together more coherently, and that there is no overall conclusion.

In fact, open-endedness is very much the hallmark of this collection of essays,

and as someone already familiar with a lot of the issues, I found this frustrating. It is of course extremely valuable to inform people of new scientific approaches and the ethical questions they raise, and this book does that well. Nor should we expect to be handed pat answers on a plate – they don't exist. But surely it is time we started using the Christian principles this book champions to formulate some prospective solutions to these dilemmas. Only Michael Rees, in his thought-provoking chapter on transplantation ethics, pushes us to try and reach a conclusion on the rights and wrongs of the question, and even he does not make his own opinion clear.

In summary, then, I did enjoy reading this and would recommend it to someone wanting to know where to start in Christian bioethics. But, like a not-too-filling appetizer, it left me pining for the main course.

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Philip Luscombe
Groundwork of Science and Religion

Peterborough: Epworth Press, 2000,
274 + xiii pp. pb. £12.95.
ISBN 0-7162-0535-1.

Luscombe has provided a great service for all undergraduates who have to study science and religion: in less than 300 pages he has produced an excellent survey of the main contours of the subject.

After an introductory chapter, the next two describe the history of the relationship between science and Christianity, focussing, inevitably, on Galileo and in the third chapter on Darwin. Chapters 4 and 5 examine the nature of science: chapter 4 from the perspective of philosophy and chapter 5 from a sociological viewpoint. The latter is most welcome, as it should bring to a larger audience the controversial work of the sociologists of science such as Barnes, Bloor, Collins and Mulkay. It also includes a brief – perhaps too brief – look at postmodern challenges to science, including a discussion of Sokal's (in)famous *Social Text* paper (not *Social Trends* as Luscombe maintains).

Chapter 6 examines 'Scientific views of the world'. Here Luscombe traces the achievements of science up to the end of the last millennium. A review of different models for the relationship of science and religion follows and chapter 8 provides an interesting introduction and discussion of Tom Torrance, Pannenberg, Gilkey and more surprisingly Dan Hardy. The final chapter is a wide-ranging discussion of some areas in which he perceives science and theology overlap, notably original sin.

Unfortunately, there is little worldview analysis here and nothing on the recent design movement associated with Dembski, Behe and others. Despite these quibbles, it remains an excellent resource. It will be ideal for students who don't have the time to read all the relevant literature, though I hope it will be used as a stepping stone to the secondary literature, rather than as a replacement. In sum: a good summary of the terrain, but providing few new insights.

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Peter Barrett
Science and Theology since Copernicus

Pretoria: Unisa, 2000. 204pp. pb. £10.30,
$15.80. ISBN 1-86888-148-2

Most introductory books on science and theology contain a little historical background, usually not amounting to much more than brief nods in the directions of Galileo and Darwin. Peter Barrett's new book is unusual in devoting about half it's space to historical issues. The discussion is organised around quite detailed

accounts of a series of seminal figures, from Copernicus to Newton in the case of physical science and from Linnaeus to Darwin in the case of biology. This material is clearly and interestingly presented. It is followed by a fairly standard account of the insights of 'the new physics', arising from the cosmologists' investigations into the history of the universe and from the beginnings of the study of the behaviour of the complex systems. A final chapter gives a discussion of the various forms that contemporary interactions between science and theology are taking and so provides an overview of a number of contemporary issues, such as divine action and the concept of kenosis in creation. The author emphasises the importance that he attaches to the concept of beauty as an aid to understanding.

The book would be particularly useful for a course that wanted to give special attention to historical questions.

To obtain a copy of this book contact the author [BARRETT@nu.ac.za or Fax: 27 31 6550].

John Polkinghorne was formerly President of Queens' College, Cambridge.

Dieter T. Hessel and Rosemary Radford Ruether (eds)

Christianity and Ecology: Seeking the Well-Being of Earth and Humans

London, England & Cambridge, Mass.: Harvard University Centre for the Study of World Religions Publications 2000. xlvii + 720pp. pb. £17.95 & $26.95. ISBN 0-945454-20-1.

The Harvard University Centre for the Study of World Religions has already published volumes on Buddhism and Confucianism in their series World Religions and Ecology, arising from a number of conferences from 1996 to 1998. This latest book is a formidable collection of nearly 40 essays, and in a review of this length it is clearly impossible to do more than indicate briefly the general outline of the book's contents. The essays are arranged under five headings:

- Creator, Christ, and Spirit in Ecological Perspective
- Vision, Vocation, and Virtues for the Earth Community
- The Universal and Particular in Ethics and Spirituality
- Toward Global Security and Sustainability
- Christian Praxis for Ecology and Justice

While the names of most of the authors may not be well known to readers of *Science and Christian Belief*, others are: Ian Barbour, Thomas Berry, John Cobb, Jr., Calvin DeWitt, Elizabeth Johnson, Sallie McFague and Rosemary Radford Ruether. Brief biographical details of all contributors (639-648) reveal that, in spite of the global scope of the Series Title, nearly all the contributors are from the USA, and it is doubtful whether the conspicuous liberal theological leaning of the volume as a whole would be representative of global Christian thinking on the subject.

Thus, near the beginning of the book, an introductory essay by Elizabeth Johnson (3-21) is followed by a reply from Gordon D. Kaufman (23-27), Emeritus Professor of Divinity at Harvard Divinity School, in which he rejects any traditional understanding of God, and takes the term 'God' as referring to 'this mysterious awe-inspiring creativity manifest in the evolutionary development of the cosmos and of life.' Other essays construct and develop theologies which often sit very light on the scriptures, except insofar as these provide material which can be accepted or rejected according to whether they fit the philosophical convictions of the writers.

For example, most of the essays present theologies which are essentially 'this-worldly' to the virtual exclusion of anything transcendent. Thus the resurrec-

tion of Jesus Christ goes almost unnoticed, as can be established by perusing the extensive index. For Ruether, for example, 'to ask how Jesus is the Christ, one must overturn the messianic myth' (108); eschatology is concerned with 'myths of immortal and perfect beginnings and ends' which 'are themselves projections of the escape from vulnerability which is at the heart of sin' (106).

There are some notable exceptions. One is DeWitt's conservative essay 'Behemoths and Batrachians in the Eye of God' (291-316) although what is missing from it is any interaction with the surrounding theologies against which it stands out so clearly. Also notable because of its careful address of biblical eschatology, and the theme of hope, is Barbara Rossing's essay 'River of God's Life in New Jerusalem: An Eschatological Vision for Earth's Future' (205-224). I also found Louke van Wensween's essay on the ecological challenge to the Virtue Ethics of Thomas Aquinas (155-171) and Steven Bouma-Prediger's response (173-182) particularly interesting. There are also some contributions from non-American sources, such as that of Marthinus Daneel ('Earthkeeping Churches at the African Grass Roots', 531-552).

Does the markedly liberal stance of this volume mean that it should be approached only with suspicion by evangelicals? Definitely not. It is valuable reading for at least two reasons. Firstly, its pages are soaked in the frustration, alarm and sorrow that many of its writers clearly feel at the perceived impotence of the modern church to face ecological issues realistically; many readers of *Science and Christian Belief* may well share those feelings. Secondly, it exposes the reader to approaches which are, for example, radically post-modernist and feminist. Given that increasing political and public attention will be given to ecological issues in years to come, and that many positions will be in dialogue with each other, it is essential that evangelical Christians understand properly the different view-points of others who are as concerned with the future of the planet as they are.

One final comment: if you are going to buy this book, check the binding. In my copy the pages of a section of the index (657-688) have been inserted upside-down.

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