

## Book Reviews

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### David Rouelle *Chance and Chaos*

Princeton University Press, 1991,  
195pp. hb. \$24.95

David Rouelle is a distinguished mathematical physicist, working principally in statistical physics. He has written a book which surveys phenomena and concepts in which chance and order have roles to play: probability, chaos theory, quantum theory, irreversibility, Gödelian incompleteness, algorithmic compressibility, information theory. In a sequence of short chapters, these and other topics are discussed with great clarity. No technical demands are made upon the reader, but there are some quite extensive mathematical footnotes for those who can benefit from them. The style is cool, with no hint of the breathlessness which sometimes afflicts popularization. If this is *haute vulgarisation*, the emphasis is on the *haute*. There is occasional whimsical address to the reader and some sardonic reflections on the less able members of the scientific community. The latter comments are clearly influenced by recollection of the difficulty Rouelle had in getting his seminal ideas on turbulence published. He speaks of the sequence by which 'controversial' ideas progressively become 'interesting' ideas, then 'well-known' ideas. There is some idiosyncrasy (we are told that the question of the collapse of the wavepacket in quantum theory is 'best left aside'). There is also a reductionist subtext, though Rouelle confesses himself struck by the deep intelligibility of the universe and the unreasonable effectiveness of

mathematics. The book constitutes a civilized account of important ideas.

**John Polkinghorne**

**John Polkinghorne is President of Queens' College, Cambridge.**

### R. N. D. Martin *Pierre Duhem: Philosophy and History in the Work of a Believing Physicist*

La Salle, Illinois: Open Court, (Eurospan, London, UK) 1991, xi + 274 pp.  
hb. £31.95; pb. £14.95

Although there have been several attempts to set the record straight, the work of Pierre Duhem is still by and large neglected. Thus Niall Martin's new study of the philosophical and historical dimensions of Duhem's work is a welcome addition to the corpus of Duhem studies.

Martin carefully places Duhem's work in its political and intellectual context: a context which goes some way to explaining the quite unjustified neglect of Duhem. He begins with the political context, offering us some insight into the difficulties facing a Catholic intellectual in the hostile environment of late 19th century France.

In such an environment it simply was not possible to keep one's beliefs private: Duhem would have been forced to take an apologetic stance. This leads us into the realms of theology and a consideration, in Chapter 3, of Duhem's religious context. The modernist controversy within the Roman

Catholic Church was then at its height and neo-Scholasticism was rapidly gaining ground. Where did Duhem's apologetic strategy place him in relation to this conflict? Martin presents him as passionately opposed to scholasticism. He objected to its subordination of the sciences to theology and he was loud in his condemnation of Aquinas as a philosophical incompetent! But he was also personally involved in the conflict, numbering amongst his personal friends the leading modernist Maurice Blondel. Thus it is hardly surprising to find scholastics condemning Duhem as a Kantian and deliberately overlooking his contributions to the history of science.

Was Duhem really a Kantian and a modernist? In the central chapters of this book which detail Duhem's philosophical position, Martin looks elsewhere for its sources. Specifically he demonstrates that Duhem was inspired by the writings of Blaise Pascal. However it was a matter of inspiration rather than discipleship: Martin shows how Duhem appropriated insights from Pascal and transformed them into something new. Thus, for example, Pascal's doctrine on ontological orders became the basis for Duhem's insistence on the autonomy of science from metaphysics.

This has important implications for his understanding of science. Not least, it means that the task of physics is not explanation since what constitutes a satisfactory explanation depends on the metaphysical system currently in favour.

In the final chapters, Martin turns to Duhem's seminal work in the history of science. He shows that Duhem initially shared the then popular belief that the period between Aristotle and Copernicus was devoid of scientific interest. It was only when he began to research his *Origins of Statics* that his views changed dramatically. Martin traces that change of mind and proceeds to an examination of Duhem's best known works: *To Save the Phenomena* and *Système du Monde*. His conclusion is

unequivocal; notwithstanding the often deliberate neglect of his work for theological or political reasons, 'Duhem remains the pioneer in all historical researches aimed at unearthing the real contribution Christian belief made to the rise of modern science and philosophy' (p. 212).

This volume is a valuable addition to the literature. It is to be hoped that it will be widely read by students of the history and philosophy of science.

**Lawrence Osborn**

**Dr. Osborne, a space physicist, is co-ordinator of 'The gospel and our culture' programme.**

**Phillip E. Johnson**  
***Darwin on Trial***

IVP (USA) by arrangement with Regnery Gateway (Washington DC) 1991, 1895pp. hb. \$19.95

This is a critique of Darwinian evolutionary writers by a Professor of Law. He concentrates on Stephen Jay Gould, Richard Dawkins and Douglas Futuyama. Like a barrister he tends to pick on extreme positions (and then sometimes admits that it is not *all* as bad as that). As a non-scientist he sometimes misses a point or advances an unconvincing argument, but often he is shrewd. He is not a 'young earth' advocate but argues that whereas small scale evolution (micro-evolution) is established, the evidence for large scale changes is so weak that it should not be treated as fact. Yet most authors when they talk about evolution mean the view that all forms of life are of one ancestry, and usually that life itself 'evolved' from non-living matter, and speak as if these were established scientific facts. He further attacks evolutionary philosophers for having no adequate foundation in science for their views and for making evolution into 'another kind of fundamentalism' which we may not question.

While he often makes telling points

it is not always quite clear what he is targeting. 'Darwinism' he attacks sometimes as a philosophy and sometimes as a scientific view that all forms of life are descended from a common stock. Occasionally he seems to be attacking micro-evolution, though he has accepted it, as when he attacks 'descent with modification'. His arguments are not new but it does no harm to have them repeated in this form. He could have quoted Darwin himself when he wrote in the last chapter of *The Origin of Species* that the view that all forms of life are descended from a common ancestor depends on 'analogy' with smaller scale changes and added 'But analogy may be a deceitful guide'. Johnson is right of course to say that it is difficult to find a lot of hard scientific evidence for large scale changes, and that evolutionary philosophies often assume what ought to be proved. If you forgive a few lapses into courtroom style, such as attacking the integrity of witnesses, it is a reasonable, non-technical argument from someone who finds the dogmatism of many authors quite unjustified but has nevertheless no thought-out alternative to offer.

**Oliver Barclay**

**Dr. Barclay is a Zoologist who was editor of Science and Christian Belief.**

**John C. Eccles**  
***Evolution of the Brain: Creation of the Self***

Routledge, 1989, 282pp. hb. £30; 1991, pb. £9.99

One has to admire the audacity of a man, even one with a Nobel prize in neurophysiology and eighty years of life behind him, who notes that 'It could be that the brain evolution story appears to be empty of facts and good only for unjustified speculations', and then goes on to say: 'nevertheless I have been able to unfold the fascinating story of hominid evolution of the human brain using creative imagina-

tion restrained by rational criticism' (Preface, xi).

The author believes that 'there is a Divine Providence operating over and above the materialist happenings of biological evolution' (p. 239) but the connection between this belief and the main content of the book is far from clear, and must mean that the book is of less interest to readers of the journal than might be expected.

Eccles has assembled an impressive array of information about hominid evolution (drawing particularly on Tobias' work), linguistics (do apes understand sign language?), and neurophysiology. On the whole the presentation of the material is clear, although the neurophysiological material will lose non-specialist readers at some points. There is much to stimulate: the story of the Laetoli footprints, for example, that appear to show an adult Australopithecine walking hand-in-hand with a child, and followed by another adult carefully stepping in the footprints of the first—all 3.6 million years ago! ('The first family?'). Or the Neanderthal cripple who 60,000 years ago survived to age 40 years—presumably indicating that his fellow Neanderthals sustained their crippled companion in a way modern apes do not.

In the earlier chapters, I found the arguments for the small size of the early hominid populations unconvincing. More importantly, the reasons for drawing a discontinuity between *A. africanus* and *H. habilis*, the first of the genus 'Homo', are unclear. Perhaps inevitably for a book drawing material from such diverse sources, Eccles is sometimes factually misleading: in the discussion about the emergence of the nuclear family (p. 111)—Eccles writes as if he is unaware that animals other than gibbons and humans form monogamous pair bonds!

As one might expect, Eccles has some good points to make about neurophysiology; pointing out, for example, that the change from quadrupedality to bipedality must have

required a considerable re-working of the nervous system. Eccles has included a great deal of diverse information about neurophysiology that is interesting in its own right but of no clear relevance to the subject of the book—e.g. the discussion of long term potentiation, believed to be part of the machinery underlying some kinds of memory and learning. The specialist notices major assertions made en-passant without any supporting discussion—for example, the claim on p. 132 that the increased area in the parietal lobe of *Homo habilis* is Area 7.

The most amazing non-sequitur of the whole book—that ‘the mental concentration involved in intentions or planned thinking can cause neural events’ (p. 189)—is no en-passant remark, however. Nerve cells in a part of the brain called the ‘supplementary motor cortex—SMA’ are active prior to spontaneous movements of monkeys, and the corresponding area in the human cortex is active during contemplation of a complex pattern of co-ordinated movement such as the sequence of notes needed to play a particular tune on the piano. Eccles assumes that these data imply that the mental processes cause the activation of the SMA cells but this is to assert exactly what we do not know. The observations say nothing about whether activation of the SMA cells is or is not brought about by a perfectly normal chain of material events in nerve cells that supply the inputs to these cells.

Eccles envisions mental events being able to produce physical consequences without upsetting known physical laws by invoking the idea that the energy needed to cause the release of one vesicle of neurotransmitter (substance by which one nerve cell affects the next) is so small as to be covered by quantum mechanical uncertainty. As a general idea this is not new—Eccles himself clearly stated it in his 1953 book—and the particular form in which Eccles reiterates it (laying stress on the importance of an ultra-microscopic structure called the vesicular grid)

leads to the bizarre consequence that the sea slug *Aplysia* has a mind! Although Eccles points out that actually the co-ordinated release of many (perhaps 1,000’s) of vesicles are needed to have any affect, the difficulties this raises for the idea is not discussed, and neither is there any discussion of whether the whole scheme is compatible with the 2nd law of thermodynamics.

The book is certainly an interesting one, and would be highly suitable as the basis for stimulating a critical discussion on the subject.

**Stuart Judge**

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**Paul Davies**

*The Mind of God: Science and the search for ultimate meaning*

Simon & Schuster, 1992, 254pp. hb. £16.99

Can science offer adequate answers to ultimate questions? The current rash of attempts to produce a Theory of Everything suggests that, for some physicists, the answer is ‘yes’.

Paul Davies is himself a mathematical physicist—but one who has already demonstrated a particular ability to explain the most esoteric aspects of his discipline in terms which are accessible to the layman. In this, his latest book, he goes behind the content of modern physics in an effort to trace the logic of scientific rationality back as far as it will go in the search for ultimate answers to the mystery of existence (p. 223).

After some introductory remarks on the nature of reason, he turns in chapter 2 to the question of origins (probably the most obvious ultimate question to which physics addresses itself). We are offered a thumbnail sketch of the answers suggested by modern cosmology. What Davies reveals is a family of

quantum cosmologies which, apparently, do away with the need for a prior cause.

Having thus set his readers up, Davies pulls the rug from under their feet. Chapter 3 opens with the assertion that 'Given the laws [of physics], the existence of the universe is not itself miraculous' (p. 73). But what is the origin of the laws themselves? This is the starting point from which he argues that the laws of physics possess a transcendent existence, that they are the modern counterpart of the Platonic Forms.

This suggests that the laws of nature can offer ultimate answers (indeed are the answer). Like Platonists of all eras, Davies is impressed by the fact that these laws may be put in mathematical form and it is to mathematics and computing that he turns next in his efforts to find the limits of scientific rationality. In a whistlestop tour of the philosophy of mathematics and computing, we are introduced to some of the great mathematicians of this century. We are also introduced to Gödel's theorem, uncomputable numbers and the halting problem—all indicators that there are very real logical limits to mathematics (and, hence, to mathematical physics). This theme carries on through chapters 5 and 6 where he tackles current speculation about the universe as a computer program and restates his belief that mathematics (and the laws of physics) transcends physical reality.

In chapter 7 he turns at last to why the universe is the way it is. In his view the rationalist quest for a unified Theory of Everything is precluded by the logical limits of mathematics. 'A contingent physical universe cannot contain within itself an explanation for itself' (p. 171). The remainder of chapter 7 and chapter 8 are devoted to an investigation of what the explanation might be. He looks in turn at several of the classical arguments for the existence of God and pays particular attention to anthropic forms of the design argument. Of the various models of God

which he covers he is most impressed by process theism.

Where does this get us in the end? Davies is not a Christian but his conclusion is by no means unsympathetic to a theistic point of view. He finds that there is an ineradicable mystery at the end of the universe—a mystery which science cannot penetrate. However, he admits that there may be other avenues into the heart of the mystery. Mysticism or revelation may offer 'the only possible path to the Ultimate' (p. 232).

As usual, Davies' writing is a model of how to make an abstract subject accessible. It is certainly much more readable than certain Christian attempts to do the same thing. I hope the book will be widely read.

**Lawrence Osborn**

**Dr. Osborn, a space physicist, is co-ordinator for 'The gospel and our culture' programme.**

**Adrian Desmond**  
***The Politics of Evolution***

University of Chicago Press, 1989,  
503pp. hb. \$40.25; £27.95

**Adrian Desmond and James Moore**  
***Darwin***

Michael Joseph, 1991; Penguin 1992,  
pb. £9.99

Christians today inevitably have to come to terms with evolution, and Adrian Desmond and James Moore have probably done more to help our knowledge and understanding of Darwin and his times than any other authors. If this review is descriptive rather than critical this is because their facts are accurate and their method (allowing for a certain sensationalism) generally credible.

*The Politics of Evolution* is a weighty book in every sense, with over 400 pages of fact-packed text. Its basic concern is the conflict between different schools of anatomy around the 1830's. I found the book difficult to get

into at first because the plethora of names and institutions tends to bewilder—even to one reasonably familiar with the period. With perseverance, however, the groups begin to become clear.

The first group of anatomists forms the 'old school', who were Cuvierian and Paleyan in their approach to design in nature, seeing each organism as individual proof of design. The group was generally associated with the English Establishment, in London Hospitals and in Oxbridge for the first quarter of the century.

The second group were followers of French 'transformationism' (i.e. evolution) as established by Lamarck (1744–1829) and Geoffroy St Hilaire (1772–1844), and imported to Edinburgh in the 1820's. They were usually radical in politics, atheist in religion, and materialist in philosophy. Leaders amongst this group were Robert Knox and Robert Grant both involved in the popular extra-mural anatomy classes in Edinburgh in the 1820's. These rival schools differed in religion and in approach: the Cuvierian/Paleyans emphasising strict empiricism, the French Transformist group being imaginative and speculative in building 'systems'.

Desmond follows the conflict between the groups in all its complexity. In the model he adopts, both groups were finally eclipsed by the rise of a third group—centred on the legacy of the scientific interest of the Romantic poet S. T. Coleridge. Coleridge himself, who moved through quasi-panteism to a fiercely trinitarian theism, has seen philosophical materialism as an evil scourge and mechanistic/atomistic views of nature as dangerous reductionism. Owen was a rising star in the Royal College of Surgeons from 1826, holding various professorships from 1836 and going on to oversee and build up the natural history sections of the British museum from 1856. Recognised as the greatest anatomist of his age, Owen was in politics a moderate (Peelite) Tory, and in religion an anglican—an archetypical 'establish-

ment' figure. Yet Owen had met both Cuvier and (through Grant) the French Transformists savants in the 1830's. Thus he was also fully aware of the positive side of 'French' morphology and comparative anatomy—and could meet the radicals on their own intellectual terms.

Unlike the old Cuvierian/Paleyans but like Grant's school, Owen recognised an overall pattern in morphology. That pattern, however, was based on divine creation through a series of 'archetypes'—we might perhaps compare them to Bach's variations on a theme. So Owen's system was within the mainstream of Christian thought in the period. But Owen's strength was in his very detailed studies, showing how many of the specifically transformist suggestions about organic development simply did not work.

The London Owenites found natural allies. One group was the 'fellow establishment' Anglican Dons at Oxbridge, e.g. the evangelical Professor of geology Adam Sedgwick. Other anti-Lamarckian geologists like Murchison and Lyell also made common cause. Desmond shows the course of the struggle between the 'transformists' and 'Owenites'.

Inevitably the radical cause was weakened as the 'established' became less obviously corrupt with nepotism and more intellectually informed. Some more moderate 'radicals' moved away from the school, or were nobbled into joining the establishment. Others, like Grant and Knox, became increasingly marginalised and regarded as eccentrics.

From the 1850's Owen and his group became involved in an increasingly bitter conflict with a fourth group which centred on T. H. Huxley. That conflict was (or perhaps one should say 'is') complex and indecisive—but to examine it we need to consider Darwin.

Darwin is one of the most significant figures in human thought, and Christians almost inevitably have to come to terms with his ideas. At the same time large amounts of nonsense

have been written about him, often by ill-informed Christians, and even recent biographies of him (e.g. the one by Wilma George) are far from adequate. Moore and Desmond's biography Darwin is easily the best currently available—being both readable and well informed. It is 'fact-packed' like *The Politics of Evolution*, but easier to read because it has a more racy style (probably Moore's influence!) and fewer new characters per page!

The complex interplay of scientific/religious schools already mentioned is the background against which Charles' own views developed. His family had moved from the (then more socially acceptable) freethinking evolutionary deism of his famous grandfather Erasmus Darwin into Anglican respectability tinged with unitarianism. At 16 he left with his older brother for Edinburgh which, in the 1820's, was the centre of the atheist and materialist school of French transformationism which included Robert Knox and Robert Grant. Darwin listened to the debates, and later became friendly with Grant who guided him in biological work. Darwin was at this time speculating with materialism, and seems to have had no clear religious conviction.

In 1827 Charles went to Cambridge university—a very different world, for Cambridge was at that time an entirely Anglican institution. Amongst the books he read in preparation was a recent apologetic work by the brilliant evangelical John Bird Sumner—later to become Archbishop (p. 48). Charles was convinced of Jesus' miracles and Divinity and associated with dons whose Anglican views varied from the basically evangelical Adam Sedgwick to John Stevens Henslow, an orthodox devotee of the 39 Articles of the Church of England. Charles became close to Henslow whom he idolised, and had no trouble in signing the 39 Articles when he graduated in 1831 (p. 93). Charles was now 'Establishment', his Whig politics and Anglican conviction fitting perfectly in the Cambridge mould.

One myth often repeated about Dar-

win concerns his supposed 'amateur' status in science—a myth fuelled by his own misleading or downright incorrect statements in his later autobiography. Actually, whilst at Edinburgh he had not only received from Grant 'the best instruction in Britain on lowly sea life' (p. 101) but had also attended courses given by experts in the two rival schools of geology—Professors Robert Jameson and Thomas Hope—which included practical work (p. 42). Henslow knew geology and mineralogy as well as botany, and Charles also attended Professor Sedgwick's stimulating geology course at Cambridge (p. 94). In the summer of 1831 he went with Sedgwick on a summer field trip along key Welsh sections. Desmond and Moore relate all this—some of which has only recently come to light. When Darwin went off on the HMS *Beagle* late in 1831 he was probably one of the best trained young geologist/naturalists of his age.

Desmond and Moore portray well how, after returning in 1836, Darwin was caught uneasily between two worlds of thought. He looked up Henslow and Sedgwick (who had acted for him on materials he sent home), then went to stay in London. His old tutor Robert Grant lived very near but he refused Grant's help on his corals and virtually ignored him. Darwin's circle now was the 'Establishment', Anglicans Lyell and Owen amongst the fore. Yet, in 1837, he also began a secret notebook on transmutation. His contact with his brother's girlfriend Harriet Martineau introduced him to a new stream of radical unitarianism and determinism. His secret notebooks speculated that everything, man, mind and morality included, were the result of evolving forces. Yet much of his social aspiration and affection remained with the Anglican figures who would have found such thought 'utterly demoralising' (p. 239). Darwin now; 'thought like a Unitarian but felt for the Cambridge clerics' (p. 294). Evolution was the result of Divinely created natural law. The book portrays Darwin's continuing

inner conflict—and also emphasises the social/political aspect. The country seethed with political unrest—and the idea of evolution was used as a weapon by populist anti-cleric rabble rousers whom Darwin abhorred.

He tentatively hinted at his ideas to the arch anti-evolutionist Lyell in 1842 (p. 295)—who was stunned and dismayed. He revealed them (saying he felt as though he had committed a murder!) to the young 'puritanical' botanist Hooker in 1844 (p. 313), who was unconvinced but unruffled. Through the 1850's he nurtured his system mostly in private. The cruelty and waste of nature continually struck Darwin, and the death of his daughter Annie in 1851 'destroyed Charles' tatters of belief in a moral, just, universe', and brought the 'final death knell for his Christianity' (p. 387). Yet he retained some belief in a personal God, and did not identify with atheism. Those he looked to convince in due course were Hooker (who remained sceptical) and Huxley (who saw no evidence for evolution and had castigated the evolutionary *Vestiges* in 1844). But he also hoped for the evangelical Harvard botanist Asa Gray, the future spiritualist A. R. Wallace, and the old unitarian/Anglican Lyell (whose geology was still anti-progressivist).

*The Origin of Species* (1859) left God as a kind of absentee landlord, the designer of the laws but with no immediate role. It contained little if any actual scientific proof, but was essentially a plausible conjecture. Old transformationists, like Grant, welcomed it since some form of evolution (and any would do) was essential to their system. Unitarian and Malthusian Whigs welcomed it as a biological basis for the view of competition in society which they espoused. The more paternalistic Tories, and the old-style Anglicans like Sedgwick and Owen deplored it. From the start Darwin's basic scheme *did* have Christian adherents—like the evangelical Asa Gray—but they differed from him in seeing some kind of

'jump' for mankind, and in seeing Divine providence at work in the process.

What of Darwin's close circle? During the 1850's, the young T. H. Huxley, Hooker, Tyndall, and their group were 'discussing strategy' for the overthrow of the old bastions of clerical/political privilege in science and establishing of a new 'profession' of scientists, and 'Owen, the darling of Oxbridge divines and politicians, symbolised all that they despised' (p. 432). Ironically, Darwin's actual biology was in some ways closer to Owen's than to either Lyell's or Huxley's—the famous supposed development of the horse was, for example, first put forward by Owen to exemplify the 'ascent of life' in contradiction to Lyell's static geology (p. 433). Owen, goaded (as was Sedgwick) by a comment in *The Origin of Species* that Darwin looked to the rising young naturalists rather than the prejudiced old school, slated the *Origin* in a review, and Darwin was confirmed into an increasingly bitter anti-Owen campaign.

Yet the campaign, and much else in the early 1860's about the Huxley circle, was full of paradox. They abhorred the system of patronage and privilege which Owen wielded—yet manipulated for the advancement of their own sympathisers when their own clique eventually achieved power. They despised Owen's introduction of metaphysics of 'design' into science—yet it is hard to escape the implied metaphysics of 'absence of design' in their own system for all that Huxley tried to portray the Darwinian evolution as purely secular. Huxley vitriolically accused Owen of lying, yet both he and Darwin misrepresented and caricatured the 'creationist' position pre-1859. They claimed not to be 'atheists or materialists' (p. 560), yet Huxley's popular lectures 'sounded like materialism' (p. 568) although he denied it. Huxley coined the term 'agnostic' to mean that he did not know the truth about God or metaphysics—yet their constant denials and reduc-



tionism sounded like atheism. The extension of natural evolution to beauty, morals and mind sounded materialistic—not to mention Tyndall's view that mind would prove identical to matter, and that theology could say nothing on cosmological theory (p. 611).

Non-materialist 'Darwinians' obviously could not stomach all this. The evangelical evolutionist Asa Gray found he did not wish 'to be at all mixed up' with the Huxley set, post 1868 (p. 563). A. R. Wallace remained on good terms, but by 1869 believed 'higher spiritual powers guided human destiny' and were 'responsible for the brain' (p. 570). The Catholic Mivart, a Huxley protégé in 1869, was soon afterwards anathematised by the Huxley set for his attacks on natural selection and objections to Darwinian views of human nature and morality (p. 570). Lyell, an evolutionist by 1863, remained a Unitarian, believing in a guiding divine hand and special nature for mankind. By his death in 1875 'their camaraderie had cooled' (p. 614). In 1878 Romanes was 'now Darwin's leading protégé' (p. 632). An evangelical at university, he lost his faith in becoming a Darwinian—but then found that the universe without God had 'lost its soul and its loveliness' (p. 634). Unable to live with scepticism and agnosticism, he found his way back into Christian faith by his death in 1895.

Such evolutionary 'backsliders' arrived at notions not far from Owen or his disciple the Duke of Argyll—whether they remained on cordial terms with Darwin (Gray, Lyell and Wallace) or were anathematised with Owen (Mivart). But what was the controversy about? Not natural selection. Darwin wavered on this more than Wallace, and Huxley all but dropped it (p. 642). If there is one fault with Desmond and Moore's book it is that it fails really to tell us what it was about. One suspects that, at base, it was because 'agnosticism' meant in practice a denial of any expression of deity whilst enjoying the appearance of

'open mindedness' in conceding the possibility of a God. Perhaps the presence or absence of animosity toward theists and spiritualists depended just on personalities and perceived social threat.

Darwin himself was a paradox on religious matters. In the early 1860's he encouraged dissemination of Gray's reconciliation of faith and evolution—whilst then moving to demolish it in *The Variations* in 1868. In 1881 Darwin praised and recommended William Graham's *The Creed of Science* which downgraded natural selection and defended belief in God, freewill, morals and immortality—although he disagreed with many of its conclusions (p. 653). Any belief he had in a personal God steadily declined, leaving only a vague conviction that there must be some purpose and a retreat into the assertion that metaphysics were beyond the mind of man.

What lessons can we draw from all this for today? Unfortunately, a large number of current Christian books contain 'information' on the history of geology and evolution which is just not true. Henry Morris and his young-earth disciples in particular adopt a kind of 'cowboys and indians' approach—with wicked evolutionary atheists opposed to enlightened creationist heroes. Cuvier, for example is usually portrayed as a 'hero' whilst Charles Lyell is a crypto-evolutionary villain who single-handedly corrupted geology. This just will not do. Lyell (whose influence on geology was not in any case crucial) was actually an anti-Lamarckian Anglican Establishment figure whose geology before 1860 was anti-evolutionary to the point of idiosyncrasy.

The issues, moreover, were never about Biblical literalism, but rather concerned the basic philosophical conflict between materialism and a Christian world view. For us today this is a key point. The evangelical leaders involved in the conflict—both scientists and theologians—accepted the full inspiration of Scripture. But they were not biblical literalists in the sense of

modern young-earth creationism, and saw no threat to Christian belief in accepting that the 'seven days' of Genesis were metaphorical. Owen himself was no 'literalist' and although (for complex reasons) he attacked Darwinian natural selection, he would have had no problem with some kind of evolutionary explanation as the means of divine creation. If God had used some physical mechanism in developing his series of archetypes, so what? The crucial point was that the spiritual and not the material was ultimate—the organic world was a product of design.

Moore's earlier work shows us that in the half century after 1859 many leading evangelicals accepted evolution—including the 'big four' professors who were founders of fundamentalism (Orr, Warfield, Wright and Strong). Others rejected evolution. But there were few, if any, mainstream leaders who saw the issue as about biblical literalism. The common enemy was materialism, and both evolutionist and non-evolutionist Christians abhorred the materialistic version of evolution propagated explicitly by Grant and Knox, implicitly by Huxley and Tyn-dall, and in a semi-disguised and genteel way by Darwin himself. In the light of Moore and Desmond's work I could understand how theologian Charles Hodge could find acceptable Asa Gray's version of evolution by natural selection, but could reject the Darwinism of Darwin himself as atheistic and materialistic.

The work of Christians like Asa Gray, Hodge and early fundamentalist thinkers can be an inspiration to those of us today who stand in their tradition. We need have no shame in recognising that evolution in itself is not opposed to faith, but equally we need to be vigilant in spotting materialist metaphysics even in the works of scientists who disavow materialism. On the other hand the adherents of the modern young-earth creationism need to recognise that their concern with 'literalism' was not that of famous earlier anti-evolutionists—from Sedgwick in 1859

to W. J. Bryan in 1925. It seems to me regrettable that so many seem to spend time denouncing those of us who still hold to the old ways of traditional non-literalist evangelical/fundamentalism, instead of joining with us in asserting the creative presence of God in all phenomena and denouncing materialistic metaphysics whenever it masquerades as science.

**V. Paul Marston**

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**A. R. Peacocke**

***Theology for Scientific Age. Being and Becoming—Natural and Divine***

Basil Blackwell, 1990, 221pp. hb. £40

'What kind of conception of how God acts in, or more generally interacts with, the world can we possibly have in the light of scientific perspectives on that world—the presuppositions of which also underlie our scientific, psychological, sociological and historical explanations of events in human experiences?' (p. 139).

Thus could one summarise the subject, work method and limits of the book that Arthur Peacocke devotes to the question of relations between Science and Religion, even if, as a scientist, he does give preference to the physical, chemical and biological realms.

After the statement that Science and Theology are interacting approaches to reality, Peacocke devotes the first part of his work to natural being and becoming. Theology must consider scientific discoveries: astronomy teaches that the Earth must inevitably disappear; suffering and death are biological conditions absolutely necessary for evolution; matter, time or space are currently shrouded in a veritable cloud of

unknownness. But above all, the author develops the question of predictability and causality, having reminded us that the diversity of the natural world could in no way throw a veil over its interconnectedness and wholeness.

If, in Albert Einstein's words, 'The eternal mystery of the world is its comprehensibility', if the various methods of interpreting cause and effect (including top-down causation), the Second Law of Thermodynamics or the anthropic principle cannot solve the equation of the Grand Unified Theory, then man must allow that 'interplay of change and law is creative' (p. 65).

And God? 'God', answers the author, 'is the ultimate ground and source of both law ("necessity") and "chance"' (p. 119). This statement supposes common human concepts about God's existence as Creator (*sensu lato*). How does one fit this in with contemporary scientific discoveries?

A first step would be to consider that 'God has a "self-limited" omnipotence and omniscience' (p. 121). God cannot know the future state of processes that are, according to the Heisenberg principle or to non-linear macroscopic systems, unpredictable. A blunt proposal, leading to a pertinent reflection on eternity: the eternity of God doesn't mean that God is timeless. God is eternal because there is no time with which God is not in relation, no time where he is not. In this way, Peacocke invites us to an understanding of creation as divine kenosis (wherein the rabbinic idea of *tsim tsum* reappears) and as natural freedom, particularly human freedom.

There remains the question of how God intervenes in the world, a question central to the book and yet which goes unanswered, for is there not 'an ontological gap between two kinds of entities across which it is difficult to see how in principle a bridge could be constructed?' (p. 148). Having dismissed the theologically ambiguous images of interaction that are body/soul and whole/part, Peacocke retains the idea of

information (which he prefers to that of energy). Divine acts, notably the creation, would thus belong to top-down causation, within the limits of unpredictability and flexibility in nature, including humanity.

The sub-title of the book is then justified: 'God cannot have a static relation to that time which is created with [structures and processes]' (p. 184). And it is probably one of the interesting features of this book, difficult at times in the conciseness of certain chapters and the numerous references to contemporary works, to have endeavoured to modernise Thomas Aquinas' definition of creation: 'a certain relationship'.

Jacques Arnould, o.p.

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**Michael C. Banner**

*The Justification of Science and the Rationality of Religious Belief*

Clarendon Press, Oxford, 1990, 193pp. hb. £25

As the title suggests this book is concerned with the philosophical defence of theism in terms of dialogue and comparison with the philosophy of science. In the acknowledgements Basil Mitchell, W. H. Newton-Smith, A. J. P. Kenny and Richard Swinburne are mentioned and these names are a clear indication of the concerns of the book and of the intellectual arena within which it is operating—and to which it is maybe, in some ways, limited.

Part One is concerned with the philosophy of science and here Banner lays foundations for his argument for the rationality of theism. Banner is critical of Kuhn for ascribing to science a rationality of rule-governed behaviour rather than a rationality of judgement based on truth.

This argument is crucial because Banner's argument for the rationality of

theism is based on a comparison between science and religious belief as involving the same kind of rationality: a rational realism which claims approximate truth in terms of the most likely explanation. Banner argues for rational realism on ontological and epistemological grounds, discussing objections raised by Wittgenstein, Rorty, Davidson and Laudan. Such realism, he claims, accounts for the success—i.e. progress—of science and is thus a rational view which itself claims to be the most likely explanation of science.

Furthermore, such a view of science provides a point of comparison with religious belief and Banner goes on in the next (and major) part of the book to argue that theism can similarly be justified as rational because it claims to offer the best explanation; the criteria which govern science and allow judgments about its explanatory power might also be applied to theism. 'Not only is taking science seriously essential to the philosophy of religion, but doing so is far from inimical to the defence of Christian theism' (p. 154).

Part Two of the book is thus an extended apologia for apologetics. Banner considers the objections of D.Z. Phillips, Lyas, Newman and MacIntyre that religious faith either can not or should not be based on explanatory justification—either because religious discourse is expressive not cognitive, or because it is in the nature of faith to be certain and unconditional; that philosophy of religion *per se* is a category mistake.

Against such views Banner argues that the models of explanation which are used to justify such a contrast between science and religious belief do justice to neither party. They frequently fail to recognise that science involves belief and commitment and that religious believers are not unconcerned with evidence and they disqualify not only religious belief but also major scientific theories from being described as explanatory. I thought that some reference to Polanyi might have been valuable—this omission surprised me

although generally I found the use of sources helpful and well documented.

Banner makes apt use of *The Origin of Species* as an example of how science may use inference to the best explanation, exercising the rationality not of rules (the rules of the scientific community, as Kuhn suggests) but of rationality of judgement.

Banner's conclusion is that 'There is no reason why (Christian) apologetics could not be as compelling as the apologetics which are made for currently accepted scientific theories' (p. 185). In the final chapter he suggests how such apologetics might be applied to the problem of evil, which can be seen—in terms of the analogy with science—as presenting a puzzle but not an anomaly, the element of mystery being balanced by the explanatory force of the theory in other areas.

Although dealing with a considerable range of complex philosophical debates, Banner's style—which is concise but lucid and easy to read—and the book's structure, including frequent summaries, make both the specific debates and the overall argument clear and accessible.

This is a good text for 2nd and 3rd year undergraduates and for further study in the fields of philosophy of science, philosophy of religion and theology. It is of value both in the discrete analyses and discussions of specific thinkers and issues (Kuhn, Popper, Wittgenstein, D.Z. Phillips etc.) and in the overall argument of which these are a part.

Although the nature of the debates is likely to preclude a very popular readership, and although his basic thesis is not new, Banner has managed to make the issues clear and accessible and I would also recommend this book to anyone with an interest in and some background knowledge of philosophy of science and religion.

**Sally Alsford**

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