S & CB (1993) 5, 155–160 0954–4194

Book Reviews

Geoffrey Cantor
Michael Faraday: Sandemanian and Scientist (A Study of Science and Religion in the Nineteenth Century)
MacMillan: London, 1991, xi + 359pp. hb. £40.00

Over the past two decades the scientific work of Michael Faraday (1791–1867) has become the object of some of the most detailed and critical studies in the history and philosophy of science. Philosophers such as Joseph Agassi have played out their methodological struggles in an effort to understand Faraday. At present the historians of science are taking their turn. Led first by L. Pearce Williams in his 1972 biography: *Michael Faraday*, and more recently by David Gooding and Frank James they have engaged in a more socially interactive interpretation of Faraday. And what a subject: a practising scientist at the Royal Institution, an elder in a despised Christian sect, an experimentalist *par excellence*! Who was this Faraday? The search for the historical Faraday, in the richest and most nuanced sense, is well under way. The chosen avenue is that of biography.

That the biographical approach opens up rich veins of research in the history of science has become plain to see in the last few years. Richard S. Westfall's magistral biography of Isaac Newton and the recent biography of Charles Darwin by James Moore and Adrian Desmond clearly display the advantages of this more particularist point of view. If science has an inherent social element then biography should be able to highlight the interaction of many factors (intellectual, social, and religious) more readily in the private life and public lives of a single personage.

This recent book, one among many celebrating the bicentenary of Michael Faraday's birth, has an intriguing subtitle: 'A Study of Science and Religion in the Nineteenth Century'. Written by Geoffrey Cantor, an accomplished historian of science, this book aims to provide a 'constructive synthesis' of Faraday's 'understanding of the external world' and his inner, religious and moral self. It wishes to round out or fill in the lacunae of previous biographers, who have allowed Faraday's letter to Ada Lovelace, in which he wrote 'there is no philosophy in my religion', to cloud their interpretation by assuming that religion and science were carefully segregated or compartmentalized by Faraday. Cantor concedes that this strategy was followed by Faraday in public, but argues that on the basis of a close examination of archival materials, the diaries of Faraday's nieces and other sources, religion as practiced by the Sandemanians was the central shaping influence in both Faraday's public and private life.

This book has a certain structural flow. In chapters 2–4 Cantor attempts to understand the Sandemanian fellowship, and Faraday as an active participant of that fellowship. The research is new and painstakingly developed. It gives us a good insight into the 'private' Faraday and his relatively closed religious community. Chapters 5–6 present a more social Faraday. How does he function in the larger society and its scientific institutions? How do his Sandemanian beliefs affect his behaviour? Much of the ground that Cantor covers is new and extremely revealing. Chapters 7–9, which I consider the heart of

the book, elucidate the influence of religion underpinning Faraday's science. Chapter 10 wishes to bring together these various strands by arguing that Faraday's passion for science and religion reflect the deep-seated psychological needs of his personality.

How successful is Cantor in this fresh and exciting interpretation of Faraday? In the brief space of this review I would like to make a few comments. Much hinges on the way religion and science are viewed or defined. In the final chapter Cantor wishes to avoid two extremes: the conflict thesis of religion and science, and revisionism which usually seeks the support of a specific religion for the development of modern science. Both of these extremes Cantor argues assume static versions of science and religion with corresponding essentialist definitions of each. By focusing on an individual as an active agent (believer and scientist) he hopes to bridge the two domains. In fact the language of domains becomes passé in Faraday's personal synthesis of science and religion. In passing, the revisionist theses of Colin Russell and Reijer Hooykaas are called into question. But there are, I think, hints of a tension in Cantor's view of religion. On the one hand it is viewed as fundamental, as a 'way of life', or as a defining mark of what it is to be human. On the other hand religion becomes identified with the biblical and moral beliefs of a sectarian community, and how they are held and practised by an individual member of that community. That tension in the 'meaning' of religion invites some sort of resolution. For Cantor that is found in Faraday's psyche in which his deep search for order and inner longing for a father figure are found in science and religion respectively. To my mind the search for certitude, knowledge, and a deep relationship are what defines us as humans: we are God-related. Then more specific questions of beliefs, practices, etc., which do in fact change over time, are expressions of that deep relatedness. I hope that doesn't make me an essentialist, but that does imply that we as humans are incurably religious creatures and therefore any effort to define religion as a domain is bound to fail. The conventional wisdom holds religion to be a set of beliefs usually identified with an ecclesiastical fellowship. That seems to be far too narrow in focus.

My secondary concern rests with Cantor's suggestion that metaphysics serves as the bridge between Faraday's religion and science. For Faraday, a conserving God of power implies that there must be a conservation of powers or forces in nature. Maybe, maybe not; it is not all that clear to me. God is also a God of change and diversity. I sense Cantor is aware of that issue since he never concludes that a 'strong causal arrow can be drawn' between Faraday's religion and science. He prefers to speak of 'resonances'. The connection, however, to Faraday's psyche seems more determined or limited: both religion and science are 'chosen responses to his psychological needs'. They may have been chosen, but one then also wonders what other responses there could have been.

All in all, I consider this book to be invaluable. Its sensitivity to religion, its nuanced reading of Faraday as a complicated person with enough foibles to make him human, call for a revised historiography. One caveat in passing: by concentrating so much on Faraday the individual and the Sandemanian fellowship, little attention is paid to the broader scientific traditions with which Faraday had to deal, either in quiet acceptance or spirited antagonism. Faraday is portrayed as idiosyncratic. True enough, but every person is born into and shaped by a tradition. How that tradition is altered by an individual is also the stuffings of history.

Arie Leegwater

Dr. Leegwater is Professor of Chemistry, Calvin College, Michigan, U.S.A.

Stephen F. Mason
Chemical Evolution: Origin of the Elements, Molecules and Living Systems
Clarendon Press, Oxford, 1991, xiii + 317pp. £19.50

To survey historical developments in such diverse fields as chemistry, astronomy, geology and quantum physics might seem imprudent. To attempt a synthesis of recent work in all these fields could be extremely rash. To do both in the same book would almost certainly raise questions as to how seriously such a volume should be taken. The publishers of this book are to be congratulated on commissioning an author who has an established reputation in both fields and whose book deserves to be taken very seriously. His theme is historical in two senses; as a straightforward analysis of scientific developments over about 150 years, and as an account of modern perceptions of a long process within historical time, the evolution of chemical elements and molecules.

The whole Darwinian fabric depends upon the emergence of the first forms of life, and these in turn must have required organic molecules of some complexity. So we are led into the chemical processes occurring within the 'prebiotic soup', when simple molecules as HCN may well have led to amino acids and those like CH_2O may have generated simple sugars. From these it is not hard to envisage the gradual build-up of far more complex molecular species. Many laboratory experiments have provided suggestive hints as to how this may have happened. The whole question gained a new dimension of interest when spectroscopic studies revealed a wide range of simple organic molecules in interstellar space with all the intriguing possibilities that that suggests.

Before there can be any organic chemistry, however simple, some at least of the present elements have to exist. The author not only traces the recent history of the concept of transmutation but also indicates how and when the process may actually have occurred. Heavy element production in our galaxy, for example, seems to have begun not more than 18 billion years ago.

But even given the 'right' elements, with the capacity for ultimately producing molecules as complex as DNA, we are still left with a formidable problem. In homely terms this may be put: why and how can we distinguish our left hand from our right? That the answer lies within the chirality ('handedness') of molecules in all living things can hardly be in doubt. In chemical science the questions of asymmetric synthesis have been around since the days of Pasteur, van't Hoff and the other founders of stereochemistry. Explanations in terms of organic, mineral or electric asymmetric environments have merely pushed the ultimate problem further and further back. Why in our primitive universe was parity (symmetry) not conserved? It has not been entirely frivolous to ask 'Is God right-handed or (more probably) left-handed?' Only in the 1980s has a credible physical answer been proposed, and that lies in the non-conservation of parity in the weak nuclear interaction observed in β-radioactive decay as long ago as 1956. Even that, of course, may not be the ultimate answer, and the theological question remains.

One must be grateful for a book that is clearly written, well-illustrated and blemished by only the mildest crop of misprints. It should be accessible to most people with a chemical training though they will have to make some difficult excursions into other sciences from time to time. Very occasionally the author relapses into remarkable obscurity, most notably in a paragraph beginning 'The democratization and unification of the universe were prerequisites for the unification of celestial and terrestrial mechanics' (p. 85). In discussing the arrival of life on earth he

manages to avoid all reference to Gaia (though whether that is a merit will be a matter for debate). There is a curious representation of a cobalt amine (p. 135), and no explanation for the conformational formulae of sugars. A few historical statements are questionable. Kekulé's benzene ring formula was certainly testable (and rejected by many for that very reason) but hardly 'rationalized the known features of aromatic chemistry' (p. 7), most of which defied rationalization for decades. And there is the old implication that van't Hoff and le Bel in 1874 liberated chemistry from the 2-dimensional, 'flatland' world of Kekulé (pp. 136, 192). Of course his benzene model was planar, but he had been using 3-dimensional models since at least 1867.

Mason's book gives a lucid account of many exciting developments in modern science, but is silent on theology. Nor is that at all a bad thing. We have learnt long ago the folly of mixing physical and theological explanations. The response of at least one Christian to this exposition is the kind of enhanced exhilaration one experiences at every glimpse into the awesome wonders of the created universe. But there is something else. Here is at work the Lord not only of nature but also of history, as surely in the age-long processes of radioactive decay and asymmetric synthesis as in the experience of ancient Israel and its successor the Church. If some parts of the Victorian church found in biological evolution evidence for the greatness of God, here in chemical evolution its successor in the late 20th century may find similar cause for praise and wonder.

Colin A. Russell

Professor Russell is Professor of the History of Science, Open University, U.K.

Bernard Lovell
Astronomer by Chance

MacMillan, London, 1991, 380pp. hb. £18.99

Sir Bernard Lovell is probably the average Englishman's paradigm of an academic boffin. In his own lifetime his monument towers over the muddy field with which his name is so inextricably identified with a permanence 'as a frontline instrument of research' that he describes as 'a phenomenon of our age'. His association with Jodrell Bank in everyone's mind is epitomised by the sobriquet 'Sir Jodrell' by which he is known in my laboratory. The unconcealable 1500 ton parabola of steel and the epic tensions of gross yet seemingly unavoidable overspending, which a quarter of a century ago looked, all too publicly, like ending with a prison sentence, are equally well known.

But I wonder how many citizens could say anything about Lovell's contribution to our country's survival in the early forties or to the dramatic changes in our concept of the Universe since then. Much has been written both by others and by Lovell on each of these very different matters and they are adequately referenced in this autobiography, but it is the author's own personal story, frankly told as he looks back over it, that gives the book its special appeal. I commend it to all, but especially to any who still retain the media image of the scientist. They will meet a man who feels (I choose the word rather than merely 'thinks') deeply about science, cricket, family, moral issues, theology and, maybe pre-eminently, music.

It is impossible for me to write this review with anything like a reviewer's usual detachment so I may as well admit my emotional involvement. Of course I have known Lovell for many years. I have shared, with far less distinction, many of the kinds of experience he describes so well. The completion of the Mark I radiotelescope in 1957 was a main incentive in

my own decision to orbit a telescope to look for sources in the X-ray part of the spectrum before any, other than the Sun, had been identified. While he was tracking the early 'Sputnik' rockets by radar we were following them optically. Before setting up the Mullard Space Science Laboratory I visited his Nuffield Radio Astronomy laboratories to learn the problems of operating far from a parent campus. But these are the bread-and-butter activities of a professor of physics; reading 'Astronomer by Chance' introduced me to the man and engendered what I can only call a sense of affection. If that is an unusually open remark for a reviewer, then perhaps I have caught something of the atmosphere of the book.

Readers of this journal will be especially interested in Lovell's last chapter, 'My Life and Thought', the very title of which points to Albert Schweitzer's seminal influence. His penultimate section, 'The Nature of Belief' left me with a feeling of rapport tinged with sadness. He starts with Barth's 'insistence that God is transcendent, known only to man when he chooses to reveal himself (as in Jesus Christ)' and continues 'It is, perhaps, the easiest rationalisation for the scientist, in which the starting point is not man's search for God but God's self-disclosure to man'.

Not surprisingly this transcendence is too stark for him and he swings towards Whitehead's 'God is not transcendent, but ... immanent'. Why, I wondered the either/or; as a physicist Lovell is no stranger to complementarity? I felt he might be holding the key to the Personality of the numinous Otherness which haunts his pages when he quoted Coulson on a God 'partly seen in science, and in art and history and philosophy, partly experience in wholly personal terms'. But as he turned, admittedly a little uncertainly, towards Tillich's concept of faith as 'being grasped by that which concerns one unconditionally' I feared lest the key was slipping from him. Would Lovell be fully satisfied with that, true as it is? I do not know, though it does encapsulate the man revealed in the preceding chapters. But I remembered that St. Paul claimed he had been grasped by Christ—no less real, much more personal and still more seminal than the existence of quasars.

Robert Boyd

Sir Robert is a Fellow of the Royal Society and Emeritus Professor of Physics in the University of London.

Bryan Appleyard
Understanding the Present: science and the soul of modern man

Picador, 1992, xiv + 283 pp. hb. £14.99

Arguably science is the most effective form of knowledge the world has yet known. The developments of the past four centuries have given us unprecedented powers to manipulate our environment. But, in addition to the technological innovations spawned by science, it has bequeathed to us an outlook on the world which has had far-reaching effects on western (and, more recently, global) culture.

Bryan Appleyard's interest in the cultural implications of science stems from interviewing Stephen Hawking for the *Sunday Times Magazine* in 1988. The result of his investigations is a powerful critique of modern scientific culture.

He adopts an essentially historical approach, tracing the development of scientific culture from the emergence of the modern scientific method some four centuries ago. Appleyard argues that the success of the scientific method provoked an epistemological crisis from which emerged a new world view.

This world view (which readers of this journal will recognise as scientism) is the bedrock of modern liberal culture. However, it precludes the possibility of talking about ultimate meaning and purpose. In the fact of its ability to manipulate the world around us, western non-scientific culture has been gradually overwhelmed and transformed.

Appleyard traces this 'long tale of decline and defeat' with particular reference to religious and moral responses. He concludes that western Christianity has been roundly defeated by the new culture of science: theological liberalism represents its capitulation.

In later chapters he examines contemporary developments. He explores the way in which doubts about the morality of hard science (fuelled by the horrors of Auschwitz and Hiroshima) have encouraged a green reaction. Within science itself, the strangeness of twentieth century physics has given rise to suggestions that we may be able to develop a new spirituality, but Appleyard remains unconvinced. The final element in his indictment of scientific culture is an examination of attempts to develop artificial intelligence and the erosive implications of this for a more humanistic view of personality and selfhood.

Appleyard's concluding chapter is both the most important and, in another respect, the weakest chapter in the book. After a lucid summary of the argument so far, he outlines the dangers of the real enemy: modern liberal culture based upon the assumptions of scientism and bolstered by the successes of science and technology. His diagnosis is superb; his proposed remedy is so feeble as to seem ridiculous. He asserts that, 'Science begins by saying it can answer only *this* kind of question and ends by claiming that *these* are the only questions that can be asked. Once the implications and shallowness of this trick are realized, fully realized, science will be humbled and we shall be free to celebrate our selves again' (p. 249). In other words, all we have to do is disentangle science from scientism. But it is *not* enough merely to reject the world view of scientism. The human spirit abhors a vacuum. Unless some constructive alternative is offered, other ideologies, perhaps even more abhorrent than scientism, will rush in to replace it.

Many historians and philosophers of science will hate this book. His historical analysis is simplified to the point of distortion. For example, Galileo's telescopic observation of the moon is blown up out of all proportion. He turns it into an icon of the scientific method. More seriously, for most of the book he confuses the method and the attendant world view: science and scientism.

Nevertheless this is a valuable book. It is a clear and resounding critique of scientism. Appleyard's journalistic abilities have resulted in a work capable of reaching a much wider audience than the more erudite tomes usually reviewed in these pages. It should be compulsory reading for all sixth-formers (and undergraduates)!

Lawrence Osborn

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