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Essay review

A field comes of age

Peter J. Bowler and John V. Pickstone (eds.), *The Cambridge History of Science. Volume 6: The Modern Biological and Earth Sciences*. Cambridge: Cambridge University Press, 2009. Pp. xxvi + 662. ISBN 978-0-521-57201-9. £90.00 (hardback).

In 1993 Cambridge University Press initiated an ambitious undertaking by commissioning a multi-volume history of science that would join the other flagship 'histories' of this or that field that the press has regularly published. It speaks well of the maturity of our discipline that this series now joins a group of around sixty scholarly histories that began with Lord Acton's fourteen-volume *Cambridge Modern History*, published in 1902. Acton's series, which he did not live to see published, probably established the modern genre of collaborative scholarly surveys on academic topics. And certainly there have been plenty since then, at first no doubt reflecting the consolidation of academic disciplines in the university sector and enabling professionals to cast fresh authority over their subject matter, and more recently helping practitioners to demarcate new fields of intellectual concern such as American theatre (say) or Western textiles. Our field's greatest institution-builder, George Sarton, partly inspired by Lord Acton's Cambridge series, began a substantial *History of Science* in 1952, but only got as far as the birth of Christianity. His *Introduction* (1927–1948) stalled in the Middle Ages and, anyway, was hardly intended for beginners. Nor was René Taton's *Histoire générale des sciences* (1957–1964) intended as a narrative in quite the sense that we strive for today. These, and other interesting details about previous attempts to produce large synthetic works, can be found in the general editors' preface to *The Cambridge History of Science*.

Here, the general editors' commitment to displaying our subject at its most comprehensive and subtle best is very evident. Few people would wish to undertake such a major task and I imagine that they might one day divulge the tortuous process of marshalling the contributors or long nights spent arguing over periodization. Lindberg and Numbers have a remarkable achievement on their hands. The books are handsomely produced; the volume editors and contributors are the very best in the field; the material is succinctly developed, compelling and contextualized. The intellectual reach is more or less the same throughout all volumes and each thematic chapter is given broadly the same number of pages as the next. The overall goal is to provide an authoritative, up-to-date account of science, mostly the Western scientific tradition, from antiquity to the end of the twentieth century, that can be read both by specialists and non-specialists. The books are being

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published in mildly sporadic order, whenever each volume is completed, and five of the intended eight are now available. The subject is arranged chronologically for the first four volumes, moving from *Ancient Science* (edited by Alexander Jones and Liba Taub) to *Eighteenth-Century Science* (edited by Roy Porter), and then breaks into thematic volumes with *The Modern Physical and Mathematical Sciences* (edited by Mary Jo Nye), *The Modern Social Sciences* (edited by Theodore Porter and Dorothy Ross), and *Modern Science in National and International Context* (edited by David Livingstone and Ronald Numbers). The individual volumes are not reference books in the conventional sense and nearly every chapter can indeed be read as a narrative. Written by acknowledged experts and including an impressive range of scholarly research, they genuinely serve as introductions and entrances into a field, yet are useful to all members of the profession and not at all simplified.

The volume under review is volume 6, *The Modern Biological and Earth Sciences*, published in 2009, and edited by Peter J. Bowler and John V. Pickstone. Coverage is the biomedical, life, and earth sciences in the nineteenth and twentieth centuries. Chapters are authored or co-authored by well-known historians in the field. Most chapters start somewhere around 1800 and end somewhere around 1960, although the chapter on the gene and that on public health push into the 1980s. Palaeontology embraces Stephen Jay Gould in 1970s mode. The environment concludes around 1970 and popular science ends in the 1950s with the briefest nod to television. Because we do not yet have the concluding volume in the series (*Modern Science in National and International Context*) to hand, it is impossible to say whether any of the biological and biomedical sciences of the last fifty or sixty years will be covered elsewhere. It will be a pity if they are not. The focus of this volume is predominantly European and North American. Unlike other volumes in the series, there are no chapters on colonial scientific practice, South Asian, Chinese, or other national traditions.

The framework for the choice of topics reflects the characteristically punchy thrust of John Pickstone's and Peter Bowler's other writings. Biomedicine is taken seriously, and this is welcome because medicine is mostly downplayed in other volumes in the set except where it plays a material role in the rise of science. There is an obvious desire to address the life and earth sciences without using Charles Darwin as the central organizing strategy. These are themes vigorously developed elsewhere by Pickstone and Bowler, respectively. The two editors have also clearly given due attention to the collecting and observational practices of the nineteenth century, while the bulk of the volume is rightly oriented towards articulating the rise of experimental and laboratory science. The thirty-three chapters, each some ten thousand words long, are corralled into four parts, labelled 'Workers and places', 'Analysis and experimentation', 'New objects and ideas' and 'Science and culture'. This appears to be a fairly innocuous structure that will not alarm any non-professionals who venture forth into these pages. Yet the categories derive from Pickstone's proposals about 'working knowledges' and really need more explanation than we get here. Pickstone's 2007 article in *Isis*, for instance, set out a historiography in which older philosophical practices were seen as being absorbed into the new 'analytic' sciences of the nineteenth century. There Pickstone suggested that analysis (the reduction of complex systems into their elements) and systematic intervention (experiment) were

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actors' primary means for understanding natural processes. As used in volume 6, however, without explanation, such labels may create the impression of scientific practice moving steadily from observation toward more highbrow theory and experiment, with some moral and cultural stuff thrown in at the end. So it is a pity that there is no chapter explicitly about fresh perspectives in the historiography of the life and earth sciences other than a few words from the editors in their introduction about the deep past of the 1960s and 1970s. Speaking personally, I have always thought (perhaps misguidedly) that historians of natural history, the earth and the biological sciences were at the cutting edge of historiography in regard to thinking about the places and practices of investigation; in understanding the reach and expertise of popular science; in revealing the theological, political, literary and cultural underpinnings of evolutionary and hereditarian proposals; and in our alertness to material culture and publishing history, the social identity of the practitioner, the meanings of classification and categorization in a postcolonial world, and the role of government, especially in instrumentation, mapping, standardization, and the bureaucratization of human lives. I missed that sense of excitement in the opening pages. Some old favourites are also absent or hard to find. The introduction in the nineteenth century of the words 'science' and 'scientist' is not discussed. Professionalization (a golden oldie) is not addressed, whereas amateurs are. Research schools appear in the introduction but are not easy to locate as objects of inquiry in the text itself. The crisis of the 'decline of science' in Britain, the worldwide emergence of new scientific societies and institutions and the onslaught of fresh publishing outlets were not obvious to me through the index. Racial science, gender issues, science overseas, anthropometrics and ethnography are in another volume. On a higher historical plane, Foucault is only mentioned four times in 662 pages, but this is better than Kuhn, who turns up once. While neither are active gurus in the field any longer, I might have anticipated that their views, which were formerly major organizing concepts to argue about, should at least be given space. Perhaps all these things are covered in other volumes. From a quick glance at the online pages of volume 5 it looks as if the modern physical and mathematical sciences have got most of the best tunes.

Grouches apart, what do we have here? There are lively and extremely cogent chapters on the institutional settings of nineteenth- and early twentieth-century earth and life sciences, which include museums (Mary P. Winsor), field stations and surveys (Keith Benson), geological industries (Paul Lucier) and universities (Jonathan Harwood). Roy MacLeod's essay on discovery and exploration dwells on scientific voyages in the pursuit of national glory and internationalist endeavour and takes the story through to the space race. Michael Worboys provides a very interesting chapter on public health, plus the only reference to eugenics that I could find in the volume. Pasteur, by contrast, comes up here and in several other chapters in different contexts, as might be expected. The chapters on the geological and pharmaceutical industries are excellent and could easily be used in teaching.

The next section of 'Analysis and experimentation' covers the traditional subject categories of zoology, botany, palaeontology and so on. All the chapters – especially botany (Eugene Cittadino); anatomy, histology and cytology (Susan Lawrence); and microbiology (Olga Amsterdamska) – are truly impressive summaries of diverse themes,

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trends and practices. The chapter on physiology (Richard Kremer) is dazzling – even with tough competition from the late Frederick Holmes on eighteenth-century physiology in an earlier volume in the same series. Darwin has his moment in the sun with Jonathan Hodge, who discusses the continuities of Darwin's theories with thinkers in his personal circle. Hodge provides one of the four mentions of Foucault, disproving that Buffon and Linnaeus ever sang from the same episteme. This Darwin chapter is necessarily very compact and shows Hodge's extraordinary skill and grasp of the issues. However, I think readers lose some intellectual mileage from this drastic curtailment of evolutionary ideas, and I would have welcomed an additional chapter dedicated to social Darwinism and evolutionary progressive proposals through the first half of the twentieth century, with a dash of eugenics as well, rather than the piecemeal approach currently in operation, with some post-Darwinian evolutionary synthesis here, some Fisherian statistics there, and Spencer dotted about everywhere (although this last is possibly an entirely appropriate postmodern literary manifestation). There is so much to admire in the chapters in this section. Each author reveals his or her field replete with philosophical and practical conundrums; moves back and forth fluently to provide adequate structural background for us to understand the issues at stake; and is stylish, concise and astute at the same time.

The third section, 'New objects and ideas', takes readers from plate tectonics (Henry Frankel) and geophysics (David Oldroyd) to ecosystems (Pascal Acot). The volume is at its very best here in the creative variety of themes and expert authorship. There is a fine survey of brain science and the behavioural sciences by Anne Harrington and an admirable chapter on biotechnology by Robert Bud, in which appears most of the molecular biology that has been allocated to this volume. Immunology has an interesting chapter, although hormones were evidently not regarded as objects or ideas sufficiently new to make the cut. Cancer has a fascinating entry (Jean-Paul Gaudillière) and includes substantive research on the history of clinical trials, risk and the history of therapies, as well as linking up with the cell theory discussed in the chapter on anatomy, histology and cytology. No other disease conditions are included in their own right, although epidemics, bacteriology and many causative agents are frequently referenced throughout. Yet AIDS, another defining condition of the twentieth century, has only two mentions in the volume, so I imagine that this, too, will turn up later in the series. There is an excitingly innovative chapter on mathematical modelling. Most remarkable of all is a masterly survey by Richard Burian and Doris Zallen that covers the emergence of the field of genetics at the same time as the object of its inquiry, the gene. Any two scholars who can present the history of genetics in nineteen accurate and supple pages deserve our unbounded admiration. Here also, a brief mention is made of model organisms, followed by a few paragraphs devoted to the emergence of epistemic things in general, although not under that name. Buried in a final footnote is an indication that the authors have constructed a website for further consultation, the only indication I noticed that we all live and work in the computer era.

The final section addresses the biological and earth sciences in cultural context. James R. Moore opens the section with a trenchant analysis of religion and science, and Peter Bowler closes with a vigorous chapter on popular science. Intervening topics are biology

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and human nature (Peter Bowler), a thoughtful chapter on experimentation and ethics (Susan Lederer), and environmentalism (Stephen Bocking). Unlike the *Early Modern* volume there is no space to consider the biological and earth sciences' effect on artistic representations or relationships with literary genres like poetry or the novel. Nor is there space to cast an eye at mesmerism, spiritualism or phrenology. Generally speaking, this volume is about science carried out by experts, and its authors make that history richly informative about the leading themes, controversies and social structures that enabled diversification, consolidation and specialization. It shows us the categories of biological and earth science emerging and the social and intellectual geography of those changes. It brings together an astonishing range of nineteenth- and twentieth-century specialisms. Fresh scholarly light is cast on those juxtapositions that illuminate both the variety and internal consistency of the scientific work being pursued. To embrace such an extensive agenda and to achieve such historical and narrative coherence is a triumph indeed.

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