BJHS **39**(2): 281–313, June 2006.

Book reviews

MARK HARRISON, **Disease and the Modern World: 1500 to the Present Day.** Cambridge: Polity Press, 2004. Pp. vi + 270. ISBN 0-7456-2810-9. £17.99, $26.95 (paperback).
KENNETH F. KIPLE (ed.), **The Cambridge Historical Dictionary of Disease.** Cambridge: Cambridge University Press, 2003. Pp. xiii + 412. ISBN 0-521-53026-1. £19.95, $27.00 (paperback).
doi:10.1017/S0007087406218272

Despite their substantial differences in structure and organization, these two volumes share a common goal: to render a global history of disease accessible to readers from a wide range of backgrounds. Mark Harrison's *Disease and the Modern World* approaches this task through a broadly conventional chronological narrative. His clear and concise account pivots on the notion of an emerging 'modern' world, the coherence and characteristics of which were shaped in part by – and certainly are rendered visible through – lay, professional, institutional and governmental responses to disease. This overarching argument gives a 'plot' to the large sweep of time and space Harrison covers, and offers a rationale for the selectivity necessary in any such account.

Harrison is eager not to conflate modernity with 'progress'; though this can be a fine line to tread, he finesses it fairly successfully. His is, however, an undeniably eurocentric approach; the first third of the volume addresses Europe almost exclusively, and even as the book's cultural and geographical scope expands with Europe's empires, it remains focused on European medicine. Moreover, given the constraints of audience and space, Harrison struggles – as would any historian of medicine – to present the central themes and events of European medicine from the Middle Ages to the nineteenth century without retracing what are, for many readers, increasingly familiar paths. The pace flags considerably when he turns to the narration of major medical discoveries, ideas and thinkers, especially in the eighteenth and early nineteenth centuries. Although admirably lucid and succinct, this version of the story adds little to previous ones, notably Roy Porter's *The Greatest Benefit to Mankind* (London, 1999). Here too, for some reason, Harrison soft-pedals his argument about the emergence of the modern. The result is that this material lacks the zest that can derive from his distinctive perspective or a more liberal use of primary sources. Elsewhere, however, Harrison's focus on modernity does help him make a virtue of necessity, as does his expertise in colonial medicine. And in his treatment of the long twentieth century – addressed specifically through chapters treating 'Disease, war and modernity' and 'Health for all? Affluence, poverty and disease since 1945' – he smoothly combines synthesis of a growing literature and original argument. Without bias or politicking, he demands that his readers witness and assess the impact of both war and poverty on the health and happiness of human populations.

Like any slim volume attempting to cover events and ideas over five centuries and six continents, and to limn major trends not just in medicine but in a globalizing society as a whole, Harrison's text – the body of it fills only 191 pages – does contain some oversimplifications and some unexamined, or at least unexplained, assumptions. Treatment of some American examples and of interactions between migration and medicine would have been strengthened by closer engagement with the most recent literature – again, a problem common to such wide-ranging texts. And there are few historical voices to be heard in this book, though perhaps, for

student readers wearied by long quotations, this is a boon. Their relief must be paid for by a loss of richness and idiosyncracy, and occasionally the unintended fostering of a sense of inevitability. Nonetheless, as a text for undergraduates studying the history of medicine in particular, or even as a creative addition to a world- or cultural-history syllabus, this volume has much to offer, including a handy glossary. Harrison has done an especially nice job in his treatment of major historiographical trends and debates, sketching them in with a light touch, and offering compelling and clear examples of the impact and limitations of different approaches. For this, all of us teaching (and indeed researching) the history of medicine should be thoroughly grateful.

By Harrison's definition, *The Cambridge Historical Dictionary of Disease* – an abridged and in parts updated version of the 1993 *Cambridge World History of Human Disease*'s final section – is certainly a 'modern' text. The volume is organized to facilitate quick reference and direct comparison and evaluation across its arc of human miseries. Entries generally present a single disease entity, though a few – for example, 'genetic diseases' and 'arboviruses' – address categories of illness. Written by a mixture of medical and scientific professionals, epidemiologists, historians and social scientists, most entries take the form of an introductory paragraph, followed by a description of the disease's characteristics as they emerged and are currently defined, and a section treating the 'history' of the disease. In the majority of entries this historical section charts the emergence and consolidation of the disease as a known and distinct entity, with reference to earliest and subsequent stages in identification (and the individuals who made those identifications); hypotheses of causation; the isolation of organisms, vectors, or environments associated with the disease; and changing methods of treatment or cure over time. Like Harrison, editor Kenneth F. Kiple and his contributors have a general audience in mind, and the entries are readable without expert or technical knowledge. Many are fascinating; perhaps surprisingly, the *Dictionary* is a fine casual read as well as a useful reference volume. Also like Harrison's volume, Kiple's is distinctly eurocentric, mentioning non-Western medical systems only in passing – even for diseases first known and much discussed in non-Western medical traditions. On the other hand, contributors to the volume often treat elegantly the complex interrelationship of disease and colonialism (Maryinez Lyon's entry on African trypanosomiasis is one fine example), economics and, sometimes, social change. Non-expert users, and those approaching the *Dictionary* with a historical disease name, may occasionally find themselves hampered by the privileging of contemporary names (for instance 'leptospirosis' instead of 'Weil's disease') and a few entries have been outpaced by medical developments. But the superb index will rescue forlorn historians and students, and the Internet can keep us all at the cutting (or suppurating, infested or healing) edge. As some critics have complained, much of this material can be found elsewhere, and much of value in this volume's big brother, the 1993 *World History*, has necessarily been cut. The entries do not engage with historiography, and the 'history' they present is of a very specific – but very useful – kind. Readers may, and indeed should, argue with the limited perspective offered by this format, but they will effortlessly acquire a reliable basic understanding of each disease as it exists today, and of its emergence onto the biomedical stage. Both Harrison and Kiple have largely succeeded at the tasks they set themselves, and readers of each volume – particularly students – will find themselves better prepared to tackle more complex and more specialized texts.

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CARSTEN KRETSCHMANN (ed.), **Wissenspopularisierung. Konzepte der Wissensverbreitung im Wandel.** Wissenskultur und gesellschaftlicher Wandel 4. Berlin: Akademie Verlag, 2003. Pp. 409. ISBN 3-05-003770-9. €49.80 (hardback).
doi:10.1017/S0007087406228279

This collection undertakes the ambitious task of developing an integrative concept of the popularization of knowledge. The aim is to broaden perspectives on the function, role and process of knowledge popularization and to expand the range of historical eras and objects of analysis included in popularization studies.

In his introductory essay, editor Carsten Kretschmann criticizes existing analyses as being at once too imprecise and too narrow. According to Kretschmann the definition of knowledge used is often strongly oriented towards scientific knowledge, resulting in over-concentration on the nineteenth and twentieth centuries. This collection, in contrast, emphasizes the difference between *Wissen* (knowledge) and *Wissenschaft* (science), the latter often understood as synonymous with the natural sciences. The intention is twofold. On the one hand, the concept of knowledge is to be extended beyond the natural and human sciences to include other disciplines and forms of knowledge. On the other, this variety of approaches is to point the way to a more flexible concept of popularization, capable of being adapted to different historical epochs and popularization strategies.

In keeping with such broad ambitions, the popularization concept that Kretschmann sketches in his introduction is very general. Central elements are that there are distinct differences of knowledge between producer and recipient; that there are fewer producers than recipients, with the number of recipients large enough to form a recognizable relationship with the 'populus'; that popularization is an intentional and motivated process; and, finally, that broadly effective diffusion media are used.

This concept must be considered a lowest-common-denominator proposal rather than an analytical tool. Its usefulness lies not in any explanatory potential, but in providing a framework loose enough to be applicable to a broad span of time and a great variety of objects of study. Whether or not it is useful in any other capacity is a question inevitably raised by the heterogeneous definitions of popularization to be found in the rest of the volume. The individual chapters are for the most part case studies, though some do address directly the questions raised by Kretschmann's broad popularization concept within their own area of study or historical period. Peter Scholz's discussion of philosophers and their audiences in ancient Greece and Sven Tode's analysis of an early modern historical work, for example, reflect the modifications needed for the concept to apply to pre-nineteenth-century phenomena and processes.

The chapters fall into roughly three categories: studies of popularization and religion in the Middle Ages, of history in the eighteenth and nineteenth centuries and of science in the nineteenth and twentieth centuries. The six contributions on the popularization of science vary greatly in quality. Especially noteworthy is Angela Schwarz's chapter on science popularization in Germany and Great Britain in the late nineteenth century. Summarizing the results gathered in her larger *Der Schlüssel zur modernen Welt* (Stuttgart, 1999), Schwarz shows that even within a relatively narrow period the motives, functions, techniques and goals of science popularization varied widely and reflected diverse and often contradictory reactions to social change. With scientific and technological insecurity widespread in the population, popularizers of science needed to develop strategies to accommodate these fears.

Taking a very different approach, Thomas Kailer investigates the role of the mass media in popularizing criminological and psychological knowledge in coverage of the sensational Haarmann serial-killer trial in 1920s Germany. Kailer's study aims at removing the strict dichotomy between producers and recipients of knowledge. Rather, he shows popularized knowledge emerging as the product of an interaction between popular opinion, the media and science.

Popularization here becomes a translation process and strategy in which knowledge is transferred and transformed on its way from one context to another.

In the end, it is not the best chapters that impress most about this volume. It is the sheer diversity of what has been subsumed, however unsystematically, under the concept of knowledge popularization.

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Fernand Hallyn, **Les Structures rhétoriques de la science. De Kepler à Maxwell.** Collection «Des travaux». Paris: Editions du Seuil, 2004. Pp. 323. ISBN 2-02-063249-7. €24.00.
doi:10.1017/S0007087406238275

The rhetoric of science is now a recognized field of study which interacts fruitfully with the philosophy of science, the sociology of science and science communication. Different theories of the rhetoric of science – ranging from argument theory to discourse analysis – have been proposed and brought to bear on relevant historical examples. Rarely, however, have rhetorical tools of analysis been used to revisit classical texts and authors in such a way that they not only accompany more classical readings but reinterpret them entirely. Fernand Hallyn's book is such an ambitious attempt. It follows an earlier study, *The Poetic Structure of the World: Copernicus and Kepler* (New York, 1990, first published in French in 1987), where some of the greatest texts of the scientific revolution were shown to embed a deep 'poetic' structure.

In this latest collection, essays range more widely to include not only Kepler, Galileo and Descartes, but also the *Encyclopédie* of Diderot and d'Alembert, Sadi Carnot and Maxwell. Two chapters deal with more general issues: the relationship between geometrical diagrams and physical reality, and the value and significance of anagrams. The abundance of historical analyses and texts itself testifies to the importance of the rhetorical analysis of science, where 'rhetoric' includes, among other things, analogies, metaphors, narratives, allegory, metonymy and synecdoche. Hallyn's analyses are not superimposed on the historical examples, as in the case-study approach, but texts and authors are left, as it were, to express themselves, in the first person, leaving the reader to explore the art of rhetorical analysis in all its nuances.

A second innovative aspect of Hallyn's approach concerns the particular meaning he attributes to rhetoric and to a rhetorical analysis of scientific texts. In his Introduction he distinguishes a *rhetorical* approach, which focuses on discourse and the use of language insofar as it is apt to persuade by argumentative and stylistic means, from a *poetic* (or 'deep rhetorical') approach, which concerns the processes of thought itself. More specifically, and more interestingly from the point of view of historians and philosophers of science, a poetic approach uses textual hints in order to unearth the elusive processes of discovery and invention themselves. It is no coincidence that one of the book's major preoccupations is with the metaphors and analogies which lie at the interface of rhetorical, philosophical and cognitive analyses. Hallyn does not dwell on the sources of the particular sense in which he uses the term 'poetics'. He clearly does not intend the Aristotelian art of imitation, but no other historical indication is explicitly given in the book. A more informed reader would guess that 'poetics' means what Renaissance authors like Lorenzo Valla and Rudolph Agricola in the fifteenth century meant by 'dialectical invention', a new branch of logic dealing specifically with the inner logic of discovery. In fact, according to Hallyn, poetics studies the emergence of new representations from facts through the 'troping' (transformation) of other already established representations.

Paradoxically, Hallyn's analysis inherits the intrinsic ambiguity of the term 'invention', which meant both the discovery of arguments apt to persuade a given public that a certain theory is true, and the discovery of the theory itself, or, as Renaissance authors liked to express themselves, the

'truth' itself. Thus Maxwell's demon, midway between narrative fiction and hard science, both manages to reduce the catastrophic undertones of the second principle of thermodynamics, thus making it acceptable, and at the same time, through a radical thought experiment which does not anticipate but substitutes for reality, enables the birth of statistical mechanics. A similar ambiguity is inherent in Hallyn's treatment of Descartes's use of a fictional narrative to reconstruct the origin of the universe in *Le Monde*. Hallyn perceptively highlights the importance of a narrative thought experiment of Descartes's: it not only shows that his proposed structure of the universe – matter in motion according to certain laws – is plausible, but also, writes Hallyn, 'constructs a new world' (p. 134). In this case narrative discourse creates an artefact, a new representation of the world, which is, according to Hallyn, 'the discursive equivalent of a machine, of an automaton' (p. 164). The use of this deeper and interesting sense of rhetoric is an important though controversial contribution to historical analyses of the processes of discovery and invention, and it adds a further dimension to sociological, logical and psychological approaches.

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CATHERINE EAGLETON, JENNIFER DOWNES, KATHERINE HARLOE, BORIS JARDINE, NICK JARDINE and ADAM MOSLEY, **Instruments of Translation.** Cambridge: Cambridge Latin Therapy Group and the Whipple Museum of the History of Science, 2003. Pp. 54. ISBN 0-906271-21-5. No price given (paperback).
PATRICK BONER and CATHERINE EAGLETON (eds.), **Instruments of Mystery.** Cambridge: Cambridge Latin Therapy Group and the Whipple Museum of the History of Science, 2004. Pp. iv + 65. ISBN 0-906271-22-3. No price given (paperback).
doi:10.1017/S0007087406248271

C. S. Lewis's exclamation 'Bless me, what *do* they teach them at these schools?' (*The Lion, the Witch and the Wardrobe*, London, 1950) is one that finds a common chord with many university teaching staff. The most common lament from humanities lecturers is the absence of classical languages, particularly Latin, in most school curricula. History students these days are often hampered by their inability to read much of the primary source material written before the eighteenth century. Crash courses for Ph.D. students and 'teach yourself' books help to remove the deficit, but it is still all too easy for historians to avoid Latin texts because of the effort involved in translation and understanding.

For this reason it is heartening to find a group in Cambridge who are endeavouring to come to terms with some truly obscure Latin texts on scientific instruments. The Cambridge Latin Therapy Group describes itself as a group of scholars 'striving to improve their skills at reading classical, medieval and neo-Latin sources' (*Instruments of Translation*, p. ii). Weekly meetings of students and academics with widely differing areas of knowledge have allowed this group to tackle successfully a number of different print and manuscript texts. Some of the results of their work appear in these two volumes, and give a clear insight into their working methods and their painstaking struggle towards understanding.

Instruments of Translation looks at three different medieval and early modern sundials – the navicula de Venetiis, a Rojas sundial that carries its instructions on its surface, and Athanasius Kircher's *columba* dial. In the first two cases the instruments themselves were used to help interpret the text describing its construction and use. Work on the *columba* dial was based on a text alone, and the group had the challenge of establishing the appearance of the instrument from a source with no visual clues. Through the essays the group show the importance of cross-referring constantly between text and object to reach an understanding of an instrument's working.

Instruments of Mystery concentrates on three instruments that are known only through texts. The first is a planetary device described in a letter by Tycho Brahe and apparently intended to show both the Copernican and Ptolemaic world systems. The second item is a tool for digging up a mandrake, a mythical plant with a root in the form of a human; a special instrument was required because of the magical nature of the plant. The third description is of *Macrolexis*, an early modern scheme for telegraphy, although in this case the text is so wilfully obscure that it seems impossible to discover exactly what the instrument was like or whether it ever existed. The mandrake device, similarly, appears on detailed study to have been intended mainly as a textual object, for demonstrating the skilled nature of medicinal plant-gathering.

In both booklets the original Latin texts are set side by side with the group's translations. In the case of manuscript sources, all addenda and excisions are included. This gives readers the opportunity to struggle with the text themselves and to decide whether or not they agree with the group's conclusions about the more obscure words and phrases. The authors are honest about translations that they have found difficult, and about those that could be open to different interpretations. They argue generally for modest interpretations rather than bold ones and believe that notes or commentary on the terms in context are essential.

The Cambridge Latin Therapy Group have shown an admirable path forward for the study of Latin texts. In drawing together specialists from a variety of disciplines they have demonstrated the importance of pooling knowledge and the benefit of working as a team to uncover meanings that might elude a single scholar. It is to be hoped that they will continue with the occasional publication of their work, to provide encouragement for all of us who labour at translation and understanding.

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EKMELEDDIN IHSANOĞLU, **Science, Technology and Learning in the Ottoman Empire: Western Influence, Local Institutions and the Transfer of Knowledge.** Variorum Collected Studies Series, CS773. Aldershot: Ashgate, 2004. Pp. xiv + 352. ISBN 0-86078-924-1. £59.50 (hardback).
doi:10.1017/S0007087406258278

Ekmeleddin İhsanoğlu over the last three decades has helped to make the long-neglected and often misunderstood field of 'Ottoman science' a rewarding one. İhsanoğlu rejects the common view that Ottoman-Islamic natural philosophy fell into a decline and degenerated following its classical period of remarkable growth. He wants to show, on the contrary, that it had its own efflorescence in the post-classical period. In particular he challenges the conception of a persisting conflict between religion and Western science in the Ottoman Empire.

This perspective also characterizes the main body of this book, a reprint collection of the author's selected papers published from 1987 to 2001. They include papers broadly evaluating the introduction of European science to the Ottoman Empire, and others that specifically consider Ottoman astronomy, *madrassa* historiography, Western-style institutions and learned societies, the establishment of Istanbul University, and finally aviation. They all illuminate the complexities of Ottoman responses to European science and technological innovations. The Ottomans strove to adopt Western innovations, science and institutions, but selectively. They were especially keen on military innovations, from cannon to airplanes, and were in fact able to keep up with European military technologies for centuries. The book, then, is a critique of the view that traditional academic institutions (*madrassa*) and religious scholars hampered the introduction of Western science and modernization programmes. The narrative of religion versus science, İhsanoğlu argues, is too simplistic and partial. He points to evidence showing that the members of

official clergy did not hinder but in fact generally supported Western-style reforms and institutions.

In his paper on the historiography of the *madrassa*, İhsanoğlu is critical of the two opposing historical schools: one that glorifies the institution, the other that blames it for religious fanaticism and intellectual stagnation in the Ottoman Empire. Analysing the shortcomings of both schools, İhsanoğlu shows that, in addition to 'Islamic sciences', the madrassa also taught 'rational sciences' such as medicine and astronomy and even geography. He reminds us that most Ottoman natural philosophers came from these institutions. This should not be a surprise, since they constituted virtually the only higher education institutions in the empire until the late eighteenth century. Their relative success or failure, İhsanoğlu suggests, should not be evaluated with reference to the old European universities.

The most interesting piece is a revision of a paper that looks at the Ottoman reception of the Copernican system. In 1660 the translation into Arabic (the Ottoman scientific language at the time) by an Ottoman scholar of Hungarian origin of a trivial book written in 1637 by a little-known Frenchman, Noël Duret, ushered in a rudimentary knowledge of the heliocentric system. Although this translation does not appear to have come as a result of awareness of the heliocentric system, the resulting debate illustrates how Ottoman scholars reconciled this new cosmology with Islam and Islamic natural philosophy. Made cautious by the strong reaction to the Copernican system in Europe, Ottoman scholars initially downplayed its religious implications, and later tried to present it as part of a realm extraneous to Islam itself in an effort to keep religion and science separate.

If the Ottomans were able to follow European innovations closely, and borrow European science freely, as these papers suggest, why then did the Ottomans not transfer or produce a natural philosophy or scientific tradition comparable to those of Europe or Japan? The explanation İhsanoğlu elaborates is shared by most historians: the Ottomans encountered and adopted Islamic science during its 'golden age', and for centuries they had little to borrow from Europe. As a result they became generally indifferent to Europe (with the exception of a few innovations), as was also the case with China. The classic example given is that of the Istanbul Observatory in the 1570s under Taqi al-Din, when it was on a par with (if not superior to) Tycho Brahe's Uraniborg Observatory, and even many of the instruments in the two places were remarkably similar. The Ottomans' military might, self-sufficiency and pride in their superiority thus prevented a fuller dialogue with Europe. The situation began to change with military defeats by European armies, starting at Vienna in 1683. But even then, İhsanoğlu believes, refining the familiar argument, the Ottomans' emphasis on practical sciences, particularly their obsession with military technology and ad hoc solutions to their military defeats, resulted in the neglect of theoretical sciences. This made it difficult for the Ottomans to grasp the nature of European intellectual and scientific transformation, and the gap widened.

These conclusions, however, imply that the Ottoman cultural interaction with Europe was limited, and often superficial and incidental. Communication was a major problem. For example, not many Ottoman Muslims spoke a European language or travelled beyond the Ottoman lands before the mid-nineteenth century. Printing became established in the 1780s, after the first Turkish printing press opened in 1729 (only to close again in 1742).

İhsanoğlu's overall message is stimulating. His work expands our knowledge of Ottoman scientific and technological interaction with Europe and, more crucially, it invites new ways of looking at a complex history. The reader of this volume, however, should expect language and presentational flaws, as well as a certain amount of overlap between chapters (though perhaps no more than is usual in such volumes).

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VOLKER FRITZ BRÜNING, **Bibliographie der alchemistischen Literatur. Band 1: Die alchemistischen Druckwerke von der Erfindung der Buchdruckerkunst bis zum Jahr 1690.** München: K. G. Saur, 2004. Pp. xii + 500. ISBN 3-598-11603-9. €248.00 (hardback).
doi:10.1017/S0007087406268274

There is of course much to be said for careful, painstaking research, but the place of serendipity is often underestimated in scholarship. This was brought home to me one day in the British Library when I had ordered a whole slough of early German (mostly anonymous) alchemical and medical treatises, so many that I did not keep track of call numbers, but one of them proved to be just what I was searching for: an early sixteenth-century treatise on miners' and alchemists' illnesses. Having saved the best of my enormous pile for last, I did not quite get through this treatise in one day and so had it held for me for the morrow. The next day I returned eagerly only to find that the book had disappeared. Only after much rushing around behind the counter was it determined that the book had never actually been checked out to me. Someone else had ordered it, but I had received it because it had been located in the stacks close to the other books I had ordered. Eventually I was able to relocate the book and use it in my research. What are the chances of such an event? And people say historians lead quiet lives!

I had a similar experience with the bibliography of alchemical literature under review. Having been asked to review the book a somewhat awkwardly (but not untowardly) long time ago, it sat on the top of a pile of tasks all the while that various contributors to the alchemy listserv run by Adam McLean were seeking answers to the question about the date that the Dutch inventor and alchemist Cornelis Drebbel first published *Tractaet van de Natuere der Elementen*. I assumed, along with other scholars, that it had been published first in Dutch in 1604, but I could only locate it and had only consulted it in a German edition, *Ein kurtzer Tractat von der Natur der Elementen und wie sie den Windt/Regen/Blitz und Donner verursachen und war zu sie nutzen* (which claims to have been translated from the Dutch), published in Leiden in 1608. As the conversation on the distribution list bubbled on, I suddenly realized I had just the tome on my desk to resolve this burning issue, and, indeed, according to this useful reference work, there seems to be no documented 1604 Dutch (or German) edition of Drebbel's work; rather the first edition was published in German in 1608 and is available in Wolfenbüttel and the Bayrische Staatsbibliothek in Munich (and, as I know from my own research, in the British Library, but the BL holdings are not included in this bibliography).

This first volume (ending in 1690) of a projected three-volume bibliography of alchemical literature, running from the commencement of printing to the present day, provides a real service to researchers in the field of alchemy and chemistry. The problem of finding first editions and tracing the complicated publishing history of many alchemical treatises has only been partially met by the various alchemical bibliographies, such as John Ferguson's 1906 *Bibliotheca Chemica* or Dennis Duveen's *Bibliotheca Alchemica et Chemica* of 1949. Brüning has located unknown editions of various texts and has been able to estimate with greater accuracy the number of printed alchemical works overall. In addition, this set of volumes will be useful to historians of the book and of culture who are attempting to follow publishing trends. It is fascinating to leaf through the 2670 entries, beginning with editions of Vincent of Beauvais, Hermes Trismegistus, and Geber in the 1470s, which are quickly joined by astounding numbers of editions in the vernacular (German) of Michael Puff von Schrick on distillation, as well as frequent editions of Hieronymus Brunschwig's book on distillation in the 1510s, followed shortly by editions that combine von Schrick and Brunschwig. Beginning in the 1530s, assaying and metalworking treatises (known as *Probir-Büchlein*) and enormous numbers of Henry Cornelius Agrippa's works appear. Paracelsus and Alessio Piemontese (the pseudonymous author of a how-to book of 'secrets' about medicine, dyeing, distilling and so on) burst onto the scene in the mid-sixteenth century, to be published in multiple and varying

editions for years. These are only a few samples of the trends that can be traced through this bibliography.

The editor, Volker Fritz Brüning, previously brought together a bibliography of comet literature. He does not attempt in this volume a theoretical or historical statement of what constitutes alchemy (saving that for the completion of the third volume), but does voice a historically informed and inclusive attitude to alchemy. While most of the alchemical literature with which I am acquainted appeared to be included, I was curious why all editions of *Kunstbüchlein*, those how-to manuals of pigment-making, dyeing, metallurgical transformation and alchemy, were excluded. For example, Brüning does not list the first printed *Kunstbüchlein* (of which I am aware), *T'bouck van wondre*, printed in Brussels in 1513, although he does, as previously noted, include Alessio Piemontese.

Having consulted auction catalogues, research libraries, and other bibliographic sources throughout Europe, the British Isles and the United States, Brüning has produced a work with the user in mind, including even call numbers of the works in libraries. Since the work is organized chronologically by year and alphabetically within each year, it gives the sort of quick overview of publishing history alluded to earlier. However, a single date at the beginning of each yearly section would have made the book even more user-friendly. The index that I presume will appear in the final volume will also be a welcome addition. A short biographical entry accompanies the first appearance of most authors' texts (although the information in the Drebbel entry was odd). This will prove a useful reference work, but I have to confess – and as a confirmed bibliophile I hate to say this – that in this new age of digital media a bibliography such as this calls out for publication not as a book but in a digital format which could be searched by author, place of publishing, printer and so on, according to a researcher's specific questions.

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Francis Bacon, **The Instauratio Magna Part II: Novum Organum and Associated Texts.** Edited with introduction, notes, commentaries and facing-page translations by Graham Rees with Maria Wakely. The Oxford Francis Bacon, XI. Oxford: Clarendon Press, 2004. Pp. cxxviii + 634. ISBN 0-19-924792-7. £120.00 (hardback).
doi:10.1017/S0007087406278270

In this volume *The Oxford Francis Bacon* presents the best-known and at the same time most criticized of Francis Bacon's writings. Since the nineteenth century, and thanks more recently to the influence of philosophers of science such as Karl Popper, Bacon has come to be associated above all with the inductive method. As a result the *Novum Organum* is today generally the only work of Bacon's *opera* read in courses of history and philosophy of science. It is unsurprising, therefore, that this work and the texts published with it in 1620 have attracted new English translations and scholarly commentaries. What has been sorely needed, however, is a critical edition of the Latin text. This volume satisfies that need. In publishing the texts of the 1620 edition (the preface to the *Instauratio Magna*, *Distributio Operis*, *Novum Organum* and *Parasceve ad Historiam Naturalem* with the *Catalogus Historiarum Naturalium*), Graham Rees has drawn on his enormous expertise with Bacon's writings to produce a work extremely useful both for the specialist reader and for the beginning student of Baconian thought.

In a long introduction Rees gives an account of the 'context' of the *Novum Organum*. He begins by situating the collection of writings of the 1620 volume in the six-part plan of the *Instauratio Magna*, then recounting the variable reception they received. Bacon's 'fall from *philosophical* grace' during the twentieth century is, writes Rees, associated with 'his relative

decline into *historical* marginality' (p. xxxviii, emphases in original). Where, as Rees sees it, twentieth-century historians ignored Bacon's achievement, Rees emphasizes Bacon's originality – to the extent that the real merits of the lord chancellor sometimes seem exaggerated. The fact that Bacon might have done some experiments and recorded experimental instances in his natural histories does not necessarily imply that he was, as Rees puts it, an 'indefatigable … *practitioner* of experiments and data collection' (p. xlii, emphasis in original). Rees goes on to summarize the contents of the 1620 volume, though from the particular perspective of his own well-known interpretation of Bacon's speculative philosophy and the so-called 'pneumatic theory of matter'. Authoritative as this reading undoubtedly is, it would have been useful, especially for the novice in Bacon's thought, for Rees to have compared his views with different approaches to the central themes of the *Novum Organum*, such as those of Antonio Pérez-Ramos.

Special mention should be made of the full presentation of the peculiar publishing history of the 1620 edition, which appeared in three different versions. Rees tries to reconstruct the sequence of events which led to these versions, drawing on technical evidence as well as on historical insight about the printers involved and Bacon's writing practices. In the end Rees rejects Gibson's claim that the volume was set up by two or more printing houses, concluding that it was the work of only one, the privileged King's Printing House.

The editorial work of Rees, with the valuable assistance of Maria Wakely, is meticulous, accompanied with textual footnotes which warrant as accurate a text as possible. The commentaries supply the text abundantly with references to Bacon's works and contemporary sources, and will be very helpful for further scholarship. The bibliography was not intended to be exhaustive and is offered only as supplementary to those found in previous volumes of the Oxford edition. Nonetheless, it would have been useful if more recent studies dealing with many of the topics discussed by Rees had been added.

As for the translation, in keeping with his decision for the preceding volumes of this edition, Rees opts for reproducing the seventeenth-century Latin in a consistent modern English text without anachronisms. Such a reasonable decision, however, produces a non-literal translation which risks obliterating fluctuations that sometimes might be relevant for understanding Bacon's thought. To refer just to one case: in one of the most important parts of the *Novum Organum* (Aphorisms ix to xx of the Second Book) Bacon presents the investigation of the *forma calidi* as an example of the earlier stages of his *nova ratio*. His exposition talks alternatively of *calidum* (warm-warmth) and of *calor* (heat). However, the translation reproduces both words indistiguishedly as *heat* (with the exception of the expression *calidum ad sensum* which is translated as 'sensible heat', p. 273). But the example of the *forma calidi* is actually one of the few passages in Bacon's work which offer us some light on the exact meaning of what is – to say the least – an ambiguous concept of form, a concept whose difficulty Rees underestimates (p. lxx). The difference between *calidum* and *calor* might be irrelevant, but it also might suggest conceptual nuances in the distinction between a 'nature' and the 'form' of that nature that should not be disregarded. Hence a more literal translation could perhaps be more helpful by offering the reader the opportunity to judge this and other obscure points.

For a long time Bacon scholars have been waiting for a better edition of what Bacon's chaplain, William Rawley, called Bacon's 'chiefest work' (p. cxvii). With this volume the *Novum Organum* has received the extremely accurate presentation that it deserves.

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NICHOLAS J. WADE, **Destined for Distinguished Oblivion: The Scientific Vision of William Charles Wells (1757–1817).** History and Philosophy of Psychology. New York, Boston, Dordrecht, London and Moscow: Kluwer Academic Publishers, 2003. Pp. xi + 310. ISBN 0-306-47385-2. $95.00 (hardback).
doi:10.1017/S0007087406288277

The title of this unusual book hints that it is intended to recover the reputation of an unjustly forgotten researcher of the late eighteenth century, William Charles Wells. Born in America, Wells was educated in Scotland but practised medicine for most of his life in London. Wells's 'scientific vision' of the title is deliberately ambiguous, referring not only to his studies of binocular vision but also to his philosophical investigations of the formation of dew, and to what Wade presents as a hypothesis of natural selection. Other researches on rheumatism, heart disease and the colour of blood are mentioned in passing.

This diversity of interests makes a thematic treatment difficult, and the first chapter describing the scientific life of Wells is devoted mainly to an account in his own words. About one-fifth of the book reproduces this autobiographical *Memoir* and two rare scientific essays. The author makes rather little use of the *Memoir*, however, suggesting few connections linking the scientific investigations of Wells to the context of his life and career. Nor is the contemporary and subsequent reception of his findings clearly analysed.

Indeed, where the impact of Wells's research is discussed, it is done in a reproachful tone implying that his importance can be objectively gauged. Thus the author deems it 'puzzling, considering the originality of his experiments', that Wells's vision research could be 'overlooked and ignored', and reproduces his essay on vision 'in an attempt to redress the neglect' of his science (p. 2). He contrasts the recognition accorded to Wells for his theory of dew formation with the lack of attention given to his speculations on natural selection, citing it as 'a clear case of the arbitrariness of scientific attribution' for ideas that were 'ahead of their time' (p. 10). The final chapter usefully discusses historical sources which, the author again notes reprovingly, usually slight Wells or omit reference to his work entirely. This historiographical survey locates Wells in the context of nineteenth- and twentieth-century thinking about vision, but merely hints at the intellectual and social factors that influenced evaluations of him.

The intervening chapters are more coherent and comprise the strongest part of the book. They give a detailed survey of eighteenth-century visual science and Wells's research, providing a readable account of the understanding of after-images, eye movements, accommodation, squinting, binocular disparity, vision-induced vertigo and other visual phenomena. A subsequent chapter describes the rise of psychological studies of vision through philosophical toys.

Unfortunately the illustrations are of low quality, usually consisting of coarse, high-contrast reproductions of disembodied heads, diagrams or apparatus arranged as collages. By contrast, the index and bibliography are useful and detailed.

The book, particularly its middle chapters, will be of considerable interest to vision scientists, but readers seeking an understanding of Wells and his times will require other sources to fill in this uneven but tantalizing account.

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FA-TI FAN, **British Naturalists in Qing China: Science, Empire and Cultural Encounter.** Cambridge, MA and London: Harvard University Press, 2004. Pp. xi + 238. ISBN 0-674-01143-0. £32.95 (hardback).
doi:10.1017/S0007087406298273

Fa-ti Fan's study is an attempt, as he puts it, to 'explain the formation of scientific practice and knowledge in cultural borderlands during a critical period of Sino-Western relations' (p. 2). In

particular he is concerned to reconstruct the British natural-historical project in China in a way that does not 'ignore the indigenous people, their motivations, and their actions' (p. 4). There is nevertheless a familiar asymmetry in Fan's account. He succeeds admirably in describing the ways British naturalists, both professional and amateur, set about collecting and classifying the unique flora and fauna of China. These naturalists, many of them diplomats, merchants or missionaries, engaged in copious correspondence, published widely and made detailed field notes in their efforts to describe and explain whatever plants and animals they could obtain. The documentary record of their activities, thoroughly examined by the author, is massive. The record for the Chinese side is, by comparison, paltry. While often serving as the agents of collection and invaluable as sources of information, the Chinese who aided the British left few documents and showed little interest in taking part in scientific research. In spite of Fan's best efforts, the Chinese figures in his story thus remain almost voiceless and appear more as adjuncts than as actors. Although Fan acknowledges the problem, he offers as a remedy only inference and cautious conjecture.

His book is divided into two parts: pre-Opium War and post-Opium War. The former traces the efforts of early British naturalists to collect while largely confined by the Canton system to a single port in south China. Early in the nineteenth century Joseph Banks, president of the Royal Society, sought to establish a corps of naturalists in Canton to gather Chinese plants for Kew Gardens. Fan describes the difficulties foreigners had gaining access to Chinese plants and animals. Most would-be collectors, whether sea captains, sailors or Banks's cadre of appointed naturalists, ended up relying for material and information on the nurseries, shops and markets of the area around the factories in Canton. Other sources of plants were the gardens of the Hong Merchants, the handful of licensed Chinese traders who monopolized commercial relations with the West.

Borrowing a page from the seminal work of Bernard Smith, Fan explores the use of Chinese artists to paint natural history illustrations for the British collectors. Efforts to retrain these artists to paint in a more realistic style capable of conveying the fine detail needed for scientific illustration led to a hybridized art that drew upon both Chinese and Western visual traditions. Illustrations of fish attained such a high degree of realism that the British ichthyologist Sir John Richardson was able to identify eighty-three new species based on these works of art alone.

After the Opium War, restrictions on foreign naturalists were gradually lifted and an array of civil officials, missionaries and merchants began to spread out across China in a disorganized and often idiosyncratic attempt to advance knowledge of China's natural history. Fan discusses the problems these mainly amateur collectors encountered in gaining entry to certain areas, in understanding what they were finding and in making systematic sense of it. Throughout he is at pains to show how important the Chinese were to this process. Chinese hunters were uniquely qualified to describe the habitat and habits of certain birds, for example. And Chinese works on natural history, geography and medicine proved invaluable if often insufficient guides to many aspects of Chinese natural history.

Fan seeks to show how tenuous the status of the researcher was in a country that did not become, as had India and much of Africa, a colony. According to Fan, British naturalists were always engaged in a process of negotiation and were inevitably dependent on Chinese help to achieve their goals, a fact which gave the Chinese more opportunities to manage, resist and benefit from the needs of the foreigners than their counterparts in a colonized society would have had. There may be some truth in this, particularly when it comes to access to remote regions, but Fan presents no compelling evidence that it was so. Nor does he explain why an Indian farmer or hunter, knowing he was a colonial subject, was likely to be more forthcoming about the natural history of local flora and fauna than an uncolonized Chinese farmer or hunter confronted with a foreigner armed with extraterritoriality and unfettered access to the local mandarin. In the end

Fan's thesis amounts to the unexceptionable assertion that foreigners depended on natives for much of what they learned.

British Naturalists in Qing China makes excellent use of a vast array of archival and published material, including Chinese sources. It is clearly written and will be of interest to both academics and general readers concerned with the development of British science and natural history. What emerges most strikingly from Fan's work is the remarkable energy and adaptability that marked the British enterprise. Lacking artists to depict their finds, British naturalists trained Chinese artists in Western realist painting; unable to travel to the interior, they culled plants from native nurseries, questioned gardeners and apothecaries, collected pelts and used every resource available to broaden their base of knowledge. Scientific curiosity engaged the energies and imaginations of a host of expatriate collectors who spent countless hours on what was a hobby carried on outside their regular duties. Fan's chronicle of the strategies they used to probe the mysteries of China's natural world shows the lengths the British were willing to go to in the service of this obsession.

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MARGARET E. DERRY, **Bred for Perfection: Shorthorn Cattle, Collies, and Arabian Horses since 1800.** Animals, History, Culture. Baltimore and London: Johns Hopkins University Press, 2003. Pp. xvi + 198. ISBN 0-8018-7344-4. £27.50 (hardback).
doi:10.1017/S0007087406308278

It has been several decades since work by James Secord and Harriet Ritvo opened the field of animal husbandry and breeding to cultural history of science. Subsequent studies have tended to concentrate either on the politically charged arena of eugenics or on the research programme of 'Mendelian genetics'. This book, surveying the history of animal breeding in Britain and North America over two centuries, thus fills a substantial gap in scholarship. The author focuses on three type-animals, crucial, she argues, in defining patterns of pure-bred breeding for cattle, dogs and horses. Considerable emphasis is placed on the role of markets in determining breed standards and on public record-keeping as a means of authenticating and publicizing pedigrees. Herd books, established from the 1820s and promoted by leading breeders such as Thomas Bates, were essential to the commercialization of pure-bred stock, especially for trans-Atlantic trade.

While Derry suggests that a 'pure-bred' is, in effect, a commercial construct, she seeks to maintain clear distinctions between true breeders and investors, between the fancies of the show and genuine improvement. Yet, as she argues, notions of purity of stock emerged from concerns about the marketability of animals. Were entrepreneurs like J. P. Morgan, who kept his favourite dog, Sefton Hero, under his bed, and built elaborate kennels with steam heat and enamelled baths, lowering breed standards by paying enormous sums for prize collies imported from Britain? The corruption of breeding practice by wealthy investors seems highly polemical, given the central importance of commercial concerns from the outset, and the ambiguous criteria of 'improvement'. Even those critical of breeding for fancy rather than utility were quick to register their new fixed-types in the appropriate herd book, promoting the fashion for their animals. Derry's case is stronger when, as for thoroughbred horses in the twentieth century, breeding becomes a tax shelter, and ownership a matter for corporations and syndicates, the value of animals determined by tax laws and depreciation.

Questions are raised as to why purchasers valued purity above all, and why purity came to be measured by pedigree, rather than by mere appearance and performance. Concerns for animal pedigrees coincided with the first printing of Burke's peerage in 1826. The relationship between animal and human breeding is hinted at, largely through a sequence of remarkable stories, such as

that of Witez II, a Polish Arabian 'war refugee' surrendered first to the Germans during the occupation, sent to sire superhorses for Hitler's supermen, and then captured again by US general George Patton Jr in 1945. Emigrating to America, the animal came to the Remount Station at cornflake producer W. K. Kellogg's California ranch, eventually fathering 215 foals before his demise.

The status of breeding as a science, although promoted by some, like Kennel Club founder Sewallis Shirley, remains uncertain. Pure-bred breeding continues to be widely regarded by its practitioners as an art, requiring ineffable skills that are remote from the procedures of the modern genetics laboratory. Practices first attributed to the Georgian improver Robert Bakewell, namely intensive inbreeding, together with an insistence on the male as the bearer of the bloodline, have persisted with apparently little alteration or theoretical elaboration until the present day.

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Kenneth Silverman, **Lightning Man: The Accursed Life of Samuel F. B. Morse.** New York: Alfred A. Knopf, 2003. Pp. vi + 503. ISBN 0-375-40128-8. $35.00 (hardback).
doi:10.1017/S0007087406318274

The dust jacket of Kenneth Silverman's biography claims Samuel Morse as 'inventor of the American electromagnetic telegraph', and such was his identification with the telegraph in the United States that the idea was mooted to rename it the 'morsograph' (p. 265). Yet Morse, son of a New England Congregational minister who was also America's pre-eminent geographer, first made his name as an artist, technically proficient though accused of lacking imagination. From the start he was preoccupied with religion and politics, including the struggle for the soul of his church against Unitarianism, and his own interpretation of the meaning of the American Revolution. He was also eager to disprove the idea that Americans were 'destitute of genius' (p. 113), and played a considerable role in promoting the education of artists, notably as founder of the National Academy of Design. Silverman's account of Morse's life in the 1820s and 1830s is a readable trot through the history of the United States at this period, as the portrait painter, well connected through his father's circle, mingled with the great and the good.

After losing an election for mayor of New York, and with his art career stalled, Morse turned his attention to the telegraph. He claimed this as his own idea and invention in 1832, and certainly spent years developing instruments and codes. Silverman is clear that credit for the code rightly rests with Morse himself, rather than with his long-time collaborator and financial supporter Alfred Vail, a man Morse tactlessly referred to as his assistant. In Morse's deteriorating relations with Vail a pattern was set which recurred with later business and technical associates, most notably in his increasingly bitter dealings with Professor Joseph Henry. Morse was given to self-promotion and vanity, while displaying a staggering naivety towards business matters. If ever a man needed a good lawyer it was he. The result was that much of his middle and later life was spent in patent wars and litigation, defending against attempts to take a share of his technical glory and the profits of telegraphy.

Silverman painstakingly processes mountains of letters and other documents – referenced here, though with a bizarre system of endnotes – but is unable to create a context for Morse's technological work in the way that he framed the artist's early life in a story of America and its self-image. The imperious and oversensitive subject himself clouds the picture with his constant rows and inconsistencies, his flirtations with photography and other topics and his preoccupation with gaining approval and honours even though he affected to despise them. Vail, whose relationship with Morse is never satisfactorily described, characterized the great man during one of his

nervous collapses as 'a complete granny' (p. 234). The pair's improved key sender and receiver marked Morse's ascension into the pantheon of American heroes, for he was enough of a man of science to use the telegraph to establish longitude (and therefore standard time across the continent) and help fix the notion that the United States was governable.

In this concentration upon Morse and his immediate affairs, there is little or nothing about how telegraph systems were designed and manufactured, nor is there a dispassionate view of Morse's achievements in the light of others' work, especially contemporaneous developments in Europe. Silverman calls all telegraphs before Morse 'semaphores', as they did not have recording instruments (p. 420), but this is a nit-picking misuse of generally understood terms. Nowhere does William Thomson's name appear, nor do those of others working to improve instruments. Furthermore, the attempts to lay an Atlantic cable between 1854 and 1866 are attributed to the efforts of the New York businessman Cyrus Field, and apparently to his efforts alone. This is a travesty of a complex and interesting story, and serves to minimize Morse's considerable contribution to submarine telegraphy, a technology barely differentiated here from the much less challenging field of overland telegraphs. Morse himself confused matters by claiming, in his old age, almost every part of the telegraph system as entirely his, and the reader too is left unclear about the true level of his achievement. This lack of a critical appraisal of his work is hard to understand, for Silverman does not shirk the task of setting out the less palatable aspects of Morse's personality, his loathing of immigrants and of Catholics, his anti-abolitionist stance on slavery and the painful neglect of his motherless children, which came back to haunt his old age. Morse may have been 'the nation's idol' (p. 278), but he could not sustain a friendship. And through the last decades of his life, it could be argued, Morse stood in the way of the telegraph's development by devoting so much time and energy in defence of his own patents and inventions.

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MICHAEL R. BAILEY (ed.), **Robert Stephenson: The Eminent Engineer.** Aldershot: Ashgate, 2003. Pp. xxvii + 401. ISBN 0-7546-3679-8. £55.00 (hardback).
doi:10.1017/S0007087406328270

Michael Bailey points out that the last (and only other) biography of Robert Stephenson was written 140 years ago. Certainly a well-researched modern biography is long overdue. Stephenson may not be as colourful a character as some of his contemporaries, but this collective book manages to bring him to life. In addition to describing Stephenson's technical achievements and placing them within the context of the engineering practice of the time, the book covers his hobbies and interests, his relationships with his family and his personal triumphs and trials, often through quotations from his and others' letters.

The first part of the book outlines in more or less chronological order the events of Stephenson's career and their significance in the development and demonstration of his abilities as an engineer, manager and politician. The opening chapter takes the story up to Stephenson's appointment as engineer-in-chief to the London and Birmingham Railway at the age of twenty-nine, emphasizing the experiences that contributed to his character and abilities as well as various setbacks and difficulties (although Bailey's use of the word 'pitfalls' was, perhaps, less than apt when one considers the fate of one of Stephenson's contractors). Subsequent chapters concentrate on the London and Birmingham Railway, the practice of Stephenson's consulting office (run as 'chambers' rather than as partnerships like those of Locke and Brunel), business dealings, locomotive design and manufacturing, international projects and extensive political and civic activities (which made him unusual among his colleagues). The chapters here address not only Stephenson's achievements in civil and mechanical engineering but also his mistakes and

weaknesses as a businessman and negotiator. The authors help to explain the incredible diversity and productivity of his career by describing the workings of his consulting firm and the contributions of his able partners, colleagues and assistants.

While the first part of the book is structured as a standard biography, Bailey wrote only five of its seven chapters, and none of the five chapters of the second part, instead calling on other experts – three engineers, two librarians and four (including Bailey) members of the Newcomen Society – to contribute as specialists. This structure works well for a subject with such an astonishingly multifaceted career, encompassing railway planning, design and construction, civil engineering and bridge design, mechanical engineering, and the administration of a firm that made not only locomotives but also stationary and marine engines, manufacturing equipment and bridge components. Each of the chapters in the second part addresses a specific area of Stephenson's work: civil engineering, management of large projects, bridge design, masonry structures and water engineering. I found the bridge chapter particularly interesting; it includes a thoughtful explanation of Stephenson's contribution to bridge design as well as an explanation of the errors in perception and inadequacies of understanding that led to the collapse of a trussed compound girder bridge in 1847.

This book is so thoroughly researched and so well put together that it is difficult to identify any area in which it could have been improved. Given the significance of religious dissent in the history of early railways, a more detailed exploration of Stephenson's religious practice would have been welcome; Julia Elton mentions that Stephenson attended the Church of England in his neighbourhood, but otherwise little is said about his religious upbringing and the extent to which he conformed to or deviated from it in later life. The book includes several charts and photos that add to the reader's understanding of complex information, including an unusual view of the Crystal Palace showing details of its structure (Stephenson served on the Royal Commission for the Great Exhibition, and was instrumental in the adoption of Joseph Paxton's design), but the maps that accompany the fourth and fifth chapters could have been more legible. The last two chapters, on masonry structures and water engineering, were more like monographs; these areas are certainly less important in an assessment of Stephenson's career and might have been better as appendices than chapters, allowing the book to end with an appreciation of Stephenson's best-known work, the Britannia Bridge.

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Allan Chapman, **Mary Somerville and the World of Science.** Bristol: Canopus Publishing, 2004. Pp. ix + 157. ISBN 0-9537868-4-6. £12.95 (hardback).
doi:10.1017/S0007087406338277

The year 2004 witnessed a welcome resurgence of interest in the writings and career of Mary Somerville. It saw the publication by Thoemmes Press of her *Collected Works*, admirably edited by James Secord, and, more recently, the appearance of this short study of Somerville's place in the nineteenth-century 'world of science'. Chapman's book aims to situate Somerville squarely within the 'grand amateur' tradition of sociable scholarship and to consider her seriously alongside the likes of Sir John Herschel, William Whewell and William Buckland.

This is an entertaining text. It sets out to convey the author's 'fascination' (p. xv) with Mary Somerville to a wider audience perhaps vaguely aware of the subject's Oxford college connection – if, indeed, they have heard of her at all. There is much, in this respect, for the general reader to enjoy. The seeming incompatibility of Somerville's private and public characters – Victorian domestic goddess and internationally acclaimed explicator of celestial mechanics – is negotiated with skill here. Unlike Somerville's censorious daughter Martha, who

removed her mother's numerous references to the importance of personal appearance from her posthumously published *Personal Recollections*, Somerville regains her intriguing personal combination of physics and frivolity in Chapman's account: '[she] loved dresses, theatre and balls just as much as she loved higher mathematics' (p. xii).

Mary Somerville and the World of Science also offers much for a more scholarly reader to digest. Chapman ensures that Somerville's experimental work receives a prominent position within a survey of her writings, as well as locating it within historical and scientific context. Making some important distinctions which are often fudged in analyses of her career, Chapman presents Somerville as an interpreter and not a popularizer; she was someone, he writes, 'showing herself an ingenious experimentalist on the one hand, and a brilliant surveyor, interpreter and high-level communicator of contemporary science on the other' (pp. 43–4). Yet, in fact, as Chapman also notes rather intriguingly, drawing upon the findings of research student Sarah Parkin, no one has yet been able to replicate Somerville's experiments concerning the effects of sunlight upon magnetism.

While there are a few oversights in this text (for example Francis, not William, Hyde Wollaston is credited with the discovery of what later became the Fraunhofer lines, and Maria Edgeworth, novelist and writer on education, is presented as Somerville's 'fellow scientific authoress'), Allan Chapman presents, on the whole, a carefully considered portrait of Mary Somerville's life and career. It is to be hoped that *Mary Somerville and the World of Science* will encourage further popular and scholarly interest in the life and writings of this most fascinatingly complex of women.

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Steven Ruskin, **John Herschel's Cape Voyage: Private Science, Public Imagination and the Ambitions of Empire.** Science, Technology and Culture, 1700–1945. Aldershot: Ashgate, 2004. Pp. xxix + 229. ISBN 0-7546-3558-9. £45.00 (hardback).
doi:10.1017/S0007087406348273

Steven Ruskin's book provides an account of John Herschel's visit to the Cape between 1834 and 1838 and of the 1847 publication of his astronomical observations. The account also serves as a foil for Ruskin's exploration of the increasingly diverse historiographies of nineteenth-century science. He includes discussions of the literatures on science and empire, exploration, scientific societies and science publishing. These historiographies are not integrated – a possibly hopeless task – but juxtaposed with each other. This pragmatic approach to the now almost overwhelmingly large body of scholarship on nineteenth-century science allows Ruskin to make observations which would have been lost if he had examined Herschel from only one perspective.

Ruskin divides his account into two sections. The first half of the book deals with Herschel's reasons for visiting the Cape, his activities at the Cape and the public reception and political appropriation of his voyage amongst not only residents of the Cape but also those of Britain and the United States. Herschel is presented as pursuing a private expedition, at best indifferent to the ambitions of the British Empire and at times opposed to it. In the second half Ruskin examines various aspects of the 1847 publication of Herschel's *Results*. Aside from a general history of the background to the publication, along with a scandal thrown in for good measure, much is made of the implications of Herschel's reliance on the patronage of the third and fourth Dukes of Northumberland. This relationship is shown to have shaped the distribution of the book as well as its appropriation for national political ends.

Probably the most important feature of Ruskin's study is its separation of Herschel's private intentions for visiting the Cape from the appropriation of his visit by the British scientific and

political elite in the pursuit of their own, often imperial, interests. Ruskin argues that Herschel's decision to go to the Cape was an expression of his own desire for adventure and scientific exploration, with Herschel seeing himself following in the footsteps of Alexander von Humboldt. It was not, therefore, mainly out of a sense of filial responsibility to follow his father William's survey of the northern sky with a survey of the southern sky. More importantly, it was not part of his intention to further the ends of the British Empire or narrowly British science. As Ruskin comprehensively documents, Herschel repeatedly turned down offers of official aid in preparing for and carrying out his trip to the Cape, including assistance from the Admiralty. Herschel wanted complete independence of action, did not want to be compromised or bothered by official connections, and was wealthy enough to support himself on the voyage.

This desire for independence and privacy could not, however, ensure that Herschel's wishes were respected. His voyage was too public, his social and scientific status too significant and the Cape of too much interest to the British public for his trip to remain private. As a result his expedition and astronomical activities were quickly appropriated by the British political establishment and were turned to the support of imperial interests. Important questions are raised here about the distinction between an individual's intention for a particular scientific activity and the political appropriation of that activity. This distinction has, for a number of potentially valid although rarely explicit reasons, been elided in much of the recent historiography of science and empire. It is, however, worth reinstating even if only to return nuance to sometimes overly dogmatic claims for the complicity of science and empire. As is apparent in Ruskin's work, science conducted with no explicit imperial intention was easily assimilated to imperial ends. In Herschel's case this fact probably says less about his science than about the depth and breadth of imperial interests. It would have been fascinating for Ruskin to have explored this issue further.

Ruskin's goes beyond most of the existing, relatively unsophisticated, accounts of Herschel's Cape visit. As mentioned, he does not take one approach to Herschel, such as the obvious science-and-imperialism theme. One consequence of this pluralism is to break down simple narratives, including national narratives. Herschel's scientific activities at the Cape were shaped by events and circumstances both at the Cape and in Britain. Historians of science at the Cape Colony have too long taken a narrowly national or regional perspective of the science conducted in the region. But, as Ruskin makes clear, what happened at the Cape was intimately shaped by events in Britain. And, as has been increasingly argued by historians of British science, the reverse was also true.

This is a fascinating study of Herschel's time at the Cape and the book of observations that resulted from the trip. It is likely to be of immense value not only to Herschel buffs and historians of astronomy, but also to historians of science in the Cape and other British colonies.

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Janet Browne, **Charles Darwin: The Power of Place.** Volume 2 of a Biography. London: Jonathan Cape, 2002. Pp. 591. ISBN 0-679-42932-8. £25.00 (hardback).
doi:10.1017/S000708740635827X

In the first volume of her landmark, two-volume biography of Darwin (see *BJHS* (1997), **30**, pp. 238–41), Janet Browne covered the first part of Darwin's life, to 1858, that dealing with the 'origin of the *Origin*'. Darwin's thought and influences – of others upon him and him upon others – are multifaceted enough to allow authors to tread the same path with new insights. Browne does this beautifully. She avoids specious interpretative hypotheses, especially those which promise a psychological key to puzzling aspects of Darwin's life, personality and thought. She works inductively, just as Darwin did.

The second volume begins with the immediate circumstances surrounding the publication of the *Origin* and then continues through the reception and elaboration of Darwin's theory. Although this is biographical territory much less covered, the narrative voice is continuous as Browne transitions from, as she observes, the world of Jane Austen to that of Trollope. Indeed, the grandeur of these volumes is owed chiefly to Browne's ability to portray the particular milieu in which Darwin lived and worked.

The leitmotif running through both of Browne's volumes is the way that Darwin constructed his own 'invisible college' in the form of a network of correspondents – 'knowledge-producing relationships', Browne calls them (p. 13). These were hierarchically organized, with Darwin in command. The purpose of the network was to keep him at the research front in the various fields that concerned him. With the publication of the *Origin* this influential, socially well-placed network transformed itself into a public-relations machine that consolidated support for Darwin's theory. Collectively its members controlled 'the scientific media of the day, especially the important journals' and key publishers, like John Murray. As a group

> they were everywhere, in the Houses of Parliament, the Anglican Church, the universities, government offices, colonial service, the aristocracy, the navy, the law, and medical practice; in Britain and overseas. As a *group that worked as a group*, they were impressive. Their ascendancy proved decisive, both for themselves and for Darwin (p. 129, emphasis mine).

It was the cohesion of this group, originating in self-consciously shared experience, which provided its extraordinary power. Besides Darwin's support group, there was clearly, moreover, a broader 'textual community' comprising all those who had read the first edition of the *Origin* – not only Darwin's core network but others of similar social or intellectual background. Thus did the *Origin* become 'public property' (p. 115), with the channels of influence and interpretation already established. The book's publication was, as Browne states, a 'defining moment' in the history of a nation mired in ambivalence and ambiguity with regard to scientific claims on the nature of humanity. Darwin forced the contested issues to be confronted publicly.

There is an interesting account here of the birth of Darwinism as a body of thought in the early 1860s and the complex way in which it expanded and grew by 'recasting, popularization, negotiation, and consolidation' (p. 256). Like any scientific theory, the emergent Darwinism was, or emergent Darwinisms were, the result of negotiation – a process which, I take it, subsumes the normative testing of hypotheses within a broader discussion involving multiple 'interest groups', for instance disciplinary clusters, and resulting in the specific format(s) in which the theory is ultimately presented. Darwin understood that this process included not only published reviews or articles, but correspondence and the informal discussion of ideas among specific groups, typically in London clubs. He had himself been a participant, as Browne notes, in 'exactly the same buzz of knowledgeable chat and correspondence. Through a well-established cycle of discussion and authentication, concentric networks of specialists usually talked things over and came to a verdict' (p. 85). Darwin's own published correspondence, together with that of many of his closest associates, makes it possible to map the flow of ideas though and between the concentric circles. Such mapping is surely one agenda item for future Darwin studies.

Browne makes it clear that Darwin himself directed the first phases of his reception abroad by sending copies of the *Origin* to selected individuals in Germany and France, well ahead of the publication date. Here, too, Darwin had first prepared the ground in substantive letters exchanged with the same figures, who were similarly grouped into concentric circles, hierarchically organized (though of course cross-cultural issues complicate matters considerably).

One of the most poignant aspects of this moving volume is that Browne has taken pains to present a kind of co-biography of Alfred Russel Wallace in the context of his relationship with Darwin, their 'interlocking lives', 'their dual story' (p. 483). Although Darwin may have been irked with Wallace on the issues, he was steadfastly loyal to him. Wallace's dislike for the term

'natural selection', for example, led him to cross it out in his own copy of the *Origin* and replace it with 'survival of the fittest' (p. 312).

Browne's biography will be the definitive one for a long time to come because she has resisted winding the narrative around any specific mechanism (whether social or psychological) proposed as a key to Darwin's thought, method or behaviour. Perhaps she is overly cautious not to have taken a position on Darwin's physical constitution; the Chagas's disease hypothesis has enough evidentiary weight to at least merit a mention.

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FREDERICK BURKHARDT, DUNCAN M. PORTER *et al.* (*eds.*), **The Correspondence of Charles Darwin, Volume 12: 1864.** Cambridge: Cambridge University Press, 2001. Pp. xl + 694. ISBN 0-521-59034-5. £55.00 (hardback). **Volume 13: 1865.** With Supplement to the Correspondence 1822–1864. Cambridge: Cambridge University Press, 2002. Pp. xl + 695. ISBN 0-521-82413-3. £65.00 (hardback). **Volume 14: 1866.** Cambridge: Cambridge University Press, 2004. Pp. xl + 655. ISBN 0-521-84459-2. £75.00 (hardback).
doi:10.1017/S0007087406368276

Scholars in many fields will salute this massive, monumental project as it reaches what could well be its halfway mark in the number of volumes to be published. The disciplined and thoughtful decisions about how to present the texts of the letters and the extensive, enlightening annotations have been thoroughly vindicated. Welcome, too, has been the policy of publishing as appendices various clarifying excursuses and additional manuscript materials, and, as in Volume 13, of including from time to time supplements printing correspondence from earlier years that was not previously available. Here letters from 1822 to 1864 fill over a hundred pages. Valuable, again, are the informative and insightful introductions to each volume, giving, in a dozen or so pages, an overview of Darwin's life and work for the period covered. The three years spanned by these volumes were mainly dominated by worries about his own and family members' health, by revising the *Origin* (1866 saw the fourth edition published), by reflecting on the controversies in many countries over that book's teachings, by work on sundry botanical topics, including climbing plants and dimorphic flowers, and by preparing his big treatise published in two volumes in 1868, *The Variation of Animals and Plants under Domestication*. As to general theoretical subjects, it is Darwin's hypothesis of generation, pangenesis, that is particularly prominent; indeed, there may have been a case for printing the 1865 manuscript sketch of the hypothesis, previously published in full only once before, in this journal, by Robert Olby in 1963. Perhaps it could be fittingly printed in the volume for 1868, the year when the hypothesis was eventually published in *Variation*.

These are not among the most dramatic years for Darwin. Moviemakers would not naturally concentrate on this period; nor, indeed, do those biographies – most notably Adrian Desmond and James Moore's – that are written with knowing debts to cinematic traditions. Nor do these volumes of correspondence transform dramatically the views of these years conveyed by the older compilations of correspondence and memoirs made by Darwin's son Francis. What they do make possible, however, not least through the riches supplied in the notes and commentary, are historiographical advances in the microsociology of Darwin's scientific endeavours. For they enhance our knowledge of the many interactions Darwin had with institutions, publishers, critics, collaborators, supporters, mentors and protégés. Like all elucidations of small pictures, these should challenge us to integrate smaller pictures with larger ones. This challenge is especially well worth taking up at this time because historians of Victorian Britain have in recent years been discussing all sorts of novel reinterpretations of that epoch, as the best textbook overviews now

explain. Nor, naturally, does such reinterpreting only concern British affairs, for the wider global stories of that age are being rewritten too. The relevance of such developments for the history of science is easily illustrated with one telling example from these three volumes. No one was a more important correspondent with Darwin in this period than J. F. T. (Fritz) Müller. He had emigrated to the German Blumenau colony in Brazil in 1852, partly, it seems, to enjoy more freedom of speech than he could in Germany. Such an individual biographical case raises, directly, very general questions about German nationalism, the imperial and other relations between Europe and Latin America, and the geopolitical setting for those relations. Fritz Müller may be a subject whose time has come, especially with the publication recently of David West's invaluable biography (*Fritz Müller: A Naturalist in Brazil*, Blacksburg, 2003). These Darwin correspondence volumes can contribute decisively to the understanding of such topics.

The editing and commentary work in all the volumes to appear has been carried out so meticulously and judiciously that it seems churlish in the extreme to register any complaints. However, it may be appropriate to observe that while fine details invariably receive scrupulous attention, larger matters are just occasionally treated less adequately.

In one case an understandable error is unfortunately of some consequence. Note 6 on p. 343 of Volume 12 identifies John F. W. Herschel as the author of a nebular hypothesis, when it should be his father William. The error is consequential because the son, although intensely loyal in other ways, opposed all nebular hypotheses. What is more, it may well be that Charles Lyell's refusal to integrate such hypotheses with geological science – and associated proposals about the Earth's cooling and calming from an original molten fluid state – was strengthened by knowing that his friend and the most esteemed English physicist and astronomer of the late 1820s, the younger Herschel, was taking this stand. So Darwin's own wariness of such hypotheses, at least in public, had precedents in two of his main mentors on such subjects.

Cavils can be raised too about note 7 on p. 415 of Volume 13, where *verae causae* are simply identified, and unhelpfully and incorrectly so, as 'true conditions' without any further comment or reference. This is unfortunate, as there is now a considerable literature, going back several decades, showing that the Newtonian doctrine of true causes – that is, known or independently evidenced rather than purely hypothetical causes – was essential to Herschel's and Lyell's and hence Darwin's understanding of what constitutes good science, as can be confirmed by checking the recent *Cambridge Companion to Darwin* (Cambridge, 2003) or the Spring 2005 issue of the *Journal of the History of Biology*, an issue specially devoted to interpretations of the 'Darwinian revolution'. There is a connection indeed with nebular hypotheses and those associated geological doctrines, as these were objected to by John Herschel and by Lyell as not meeting the *vera causa* ideal, with both men having perhaps theological qualms, too. Naturally, the editors of Darwin's correspondence cannot be held responsible for all the literature on every aspect of Darwin's science as it is manifested in his and his correspondents' letters; but when so much time and care is rightly being spent on the notes, which are often longer than the letters themselves, it seems fair to expect that larger matters should get proportionate attention along with smaller ones.

The old truism is as true of these volumes as of their predecessors: it is a measure of how supremely well the daunting and demanding work has been done that any reviewer is very hard put to show that he or she has read and reflected closely enough to find a flaw or two worth mentioning. All those scholars saluting the project's successful arrival at this stage will be warmly wishing the endeavour well as it goes into its second half.

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BASIL MAHON, **The Man Who Changed Everything: The Life of James Clerk Maxwell.** Chichester: John Wiley, 2003. Pp. xx + 226. ISBN 0-470-86088-X. £18.99 (hardback).
doi:10.1017/S0007087406378272

Physicists consistently rank James Clerk Maxwell in their all-time top three, behind only Newton and Einstein. He made great contributions to electromagnetism, the kinetic theory of gases and many other fields, and historians of science have long made the study of his work the focus of a lively cottage industry. Nonetheless, Maxwell has not yet been the subject of a full-scale scholarly biography. The *Life* written by his friend Lewis Campbell and his student William Garnett and published in 1882 is admirable in many ways, and the handful of more recent short biographies rely heavily on Campbell's portrait and on the letters he and Garnett gathered and printed. Many of these letters have since been lost, probably in a fire at Maxwell's estate some years after his death. Although Peter Harman has published most of the surviving manuscript material in his edition of *The Scientific Letters and Papers of James Clerk Maxwell* (Cambridge, 1990–2002), no great trove of personal papers remains. A potential biographer of Maxwell has nothing comparable to the archival mountains on which recent studies of Lord Kelvin, Charles Darwin and other Victorian giants have been erected. Maxwell has thus remained a somewhat elusive figure.

Basil Mahon is the latest writer to attempt to convey some impression of Maxwell to a wider audience. A retired civil servant (he ran the 1991 census in England and Wales), Mahon says in his preface that he had long been fascinated by Maxwell but knew little about him until a few years ago, when he started his researches by reading an *Encyclopaedia Britannica* article on the great man. He has evidently read Campbell and Garnett closely, and most if not all of Maxwell's published works as well as Harman's volumes. Mahon shows no evidence of having entered the archives himself, or of having read more than a scattering of what historians of science have written about Maxwell. This hurts his book, but not as much as one might think. If one is looking for a straightforward account of Maxwell's life and work, and is not put off by a chatty tone (Mahon almost always refers to Maxwell as 'James') and more than a hint of hero-worship, this is perhaps the best available. At times Mahon sacrifices strict historical accuracy in his quest for scientific clarity and a clean storyline, and more than once he credits Maxwell with ideas and achievements that arose only later. Thus he renders 'Maxwell's equations' of the electromagnetic field only in the symmetrical vector form they were given after Maxwell's death, and he exaggerates the degree to which Maxwell prefigured the later abandonment of purely mechanical explanation.

This is not a bad book; in fact it is much better than I expected when I first picked it up. It is no substitute, however, for the full scholarly biography that Maxwell deserves and still awaits.

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GEORGES DIDI-HUBERMAN, **Invention of Hysteria: Charcot and the Photographic Iconography of the Salpêtrière.** Translated by Alisa Hartz. Cambridge, MA and London: MIT Press, 2003. Pp. xii + 373. ISBN 0-262-04215-0. £23.50 (hardback).
doi:10.1017/S0007087406388279

This book has awaited translation into English for over twenty years. It was first published in French by Editions Macula in 1982, while Michel Foucault was still alive. Putting to work Foucault's idea of exposing the sources of medical power, the French cultural historian Georges Didi-Huberman examined the practices of photography in the major Parisian hospital for women, the Salpêtrière. Under the directorship of Jean-Martin Charcot, the Salpêtrière acquired a

photographic service, the abundant productions of which filled the pages of the *Iconographie photographique de la Salpêtrière*. The physicians, photographers and publishers associated with the hospital aimed to supply visual evidence in support of Charcot's concept of hysteria. Pictures of women in expressive poses supposedly characteristic of hysteria also provided, of course, a remarkable spectacle; 'Spectacular evidence' is the title of the first part of Didi-Huberman's book. Fifty years after they were made, the photographs of the young hysterics fascinated, among others, the surrealists, who celebrated hysteria as 'the greatest poetic discovery of the nineteenth century' (p. 148). One of the women repeatedly photographed and exposed on the pages of the *Iconographie*, Augustine, became their muse. She is the central figure in the second part of the book, 'Charming Augustine'.

Didi-Huberman was very self-conscious about the language he used. He intended it to be part of the argument and not merely decorative. His numerous *jeux de mots* must have been both a challenge and a major difficulty for the translator, Alisa Hartz, though she has taken great care to convey his meaning. As with the French original, the new English version includes a large number of well-reproduced illustrations.

It is not by chance that Didi-Huberman refers in the title of his book to the 'invention' rather than 'discovery' of hysteria. The choice reflects the idea, shared by Didi-Huberman with many observers (beginning with the contemporary opponents of Charcot), that in the Salpêtrière the patients were manipulated into their illnesses. In the author's words,

> this institution was structured as a bribe: in fact, every hysteric had to make a regular show of her orthodox 'hysterical nature' (love of colors, 'looseness', erotic ecstasies, and so forth) to avoid being transferred to the severe 'division' of the quite simple and so-called incurable 'alienated women' (p. 170).

In the Salpêtrière the physician was both spectator and 'expectator'; he solicited the symptoms from his patients and received them at all costs, including the cruelty of not curing them. Charcot often consciously delayed the treatment of his patients until he had a chance to show them during his lectures; the miraculous cure was scheduled to happen only in public (pp. 253–4).

In the first part of the book Didi-Huberman reflects on the phenomenon of photography, deconstructing what he calls the 'legends' of its ability to certify identity, to serve as a protocol and to constitute historical evidence. Did the photographic iconography of the Salpêtrière certify the reality of hysteria? The author's answer is no. The most advanced techniques of photography at the time served only to picture 'simulacra-bodies' (p. 273). Women's bodies fled into hysterical fits to escape what amounted to moral and, at times, physical torture: their physicians undressed them, examined them in front of a crowd, measured, drugged and hypnotized them, and manipulated their reproductive organs. To top off the humiliation, these women were deprived of their life histories. They passed like ghosts into the pages of the medical records of the Salpêtrière; the lives of most of them sank into complete oblivion.

It seems, however, that, in spite of its humane appeal, Didi-Huberman's story does not tell us much more about the medical victims of the Salpêtrière. It was not one of his primary purposes to find out about these women either before or after their time within the hospital's walls. Even 'the charming Augustine', Charcot's favourite hysteric and the star of the *Iconographie*, has not received a proper history. Mentioning that Augustine herself put an end to her incarceration and fled the hospital disguised as a man, the author only comments, between brackets, 'how ironic' (p. 276). This enigmatic finale to her life is not dissimilar to the aesthetic mode in which the hysterics were dealt with in the old *Iconographie*: disguised as art forms, stared at, even admired, but not given a voice.

Since the original publication of Didi-Huberman's book, the history of psychiatry has gone further in the direction of giving personal identities to patients through restoring their life

histories and demonstrating the influence they often exerted on their physicians. This story is not yet finished.

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PETER J. RAMBERG, **Chemical Structure, Spatial Arrangement: The Early History of Stereochemistry, 1874–1914.** Aldershot: Ashgate, 2003. Pp. xxiv + 399. ISBN 0-75546-0397-0. £57.50 (hardback).
doi:10.1017/S0007087406398275

In the collections of the Science Museum there are several sets of stereochemical models ranging from the 1870s to the last decade of the twentieth century. Even Dalton's famous wooden atoms have multiple holes which could have been used to set atoms at different angles to each other. Yet the history behind many of these models is still obscure. One of them represents the stereochemical arrangement of benzene proposed by the German chemist Wilhelm Vaubel in the 1880s. Yet one would have to look very hard to find any history of chemistry which refers to his work. (Tonja Koeppel's pioneering thesis on the history of benzene theories has sadly never been published.) To be sure, Vaubel was a marginal figure in the golden era of German organic chemistry between the 1850s and 1914, but he is representative of a larger, no less historiographically invisible, group. Apart from the work of O. Bertrand Ramsay – the one reference to Vaubel prior to the volume under review was by Koeppel in Ramsay's edited volume *Van't Hoff–Le Bel Centennial* (Washington, DC, 1975) – there has been very little available on the history of nineteenth-century stereochemistry, despite its obvious importance. The familiarity of, for instance, the tetrahedral carbon atom, Fischer's celebrated work on the sugars and Werner's coordination theory has concealed the paucity of our understanding of the development of stereochemistry. Much work has been done on valency and organic reaction mechanisms, but very little on the research field that links them both intellectually and chronologically.

Peter Ramberg has now very largely done that job in his study of stereochemistry in Germany and Switzerland in the long nineteenth century up to 1914. To keep his book to a manageable length of almost four hundred pages, he has excluded the stereochemistry of benzene and cyclohexane (notably the work of Baeyer), Carl Bischoff's 'dynamic' hypothesis, and racemization, including the Walden inversion. He argues that these topics – important though they are – are not central to the history of stereochemistry. Personally I regret these omissions, especially as their inclusion would have strengthened the connection with the prehistory of organic reaction mechanisms as well as conformation analysis.

Having sketched the background to the development of stereochemistry, Ramberg begins with the context of the development of the tetrahedral carbon atom by Van't Hoff and Le Bel and then deals with its reception in Germany. He next discusses the key role played by Wislicenus in the promotion and development of the concept of 'chemistry in space'. Ramberg then turns to the second generation, namely Victor Meyer (with Auwers) and Hantzsch (with his student Alfred Werner), with particular reference to the development of the tetrahedral nitrogen atom. By 1890 stereochemistry was firmly established; the final two chapters deal with two of its major triumphs: Emil Fischer's research on the configuration of the sugars – one of the most elegant combinations of experiment and reasoning ever carried out in chemistry – and Alfred Werner's development of the concept of coordination, which raised stereochemistry to a new level. Werner's synthesis of the first carbon-free optically active compound in 1914 marks the culmination of the development of classical stereochemistry, and Ramberg quite rightly ends his account at that point.

This is a first-rate addition to the history of nineteenth-century organic chemistry and it fills a glaring gap in our current knowledge of a major branch of chemical theory. The discussion is often technical and does contain numerous formulae, but no apology is needed. Stereochemistry is a very sophisticated topic and in order to understand its development the reader has to follow the chemical arguments used. Sadly, however, the number of historians willing (or even able) to grapple with this level of technical expertise is decreasing and this must be a major concern for anyone who is anxious to see the history of organic chemistry given the same degree of scholarly attention as the history of, say, nuclear physics or psychology. Nonetheless, one hopes that Ramberg's work will form the basis of a wider investigation of the role of structural formulae in organic chemistry and its changing meaning (and value) for chemists between 1860 and 1970. There is a connection here with Leo Slater's recent papers on organic chemistry in the first half of the twentieth century. Meanwhile, this book will be of great value for all historians and chemists interested in the development of the chemistry of three dimensions.

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Alison Bashford, **Imperial Hygiene: A Critical History of Colonialism, Nationalism and Public Health.** Basingstoke: Palgrave Macmillan, 2004. Pp. ix + 264. ISBN 1-4039-0488-X. £50.00 (hardback).
doi:10.1017/S000708740640827X

The central concern of *Imperial Hygiene* is the notion of segregation in the development of public health over the nineteenth and twentieth centuries. Alison Bashford sets herself in opposition to the view, common among medical sociologists, that models of public health progressed in a linear fashion from those advocating the forced isolation of the 'unfit' to those aiming to create, through education and social conditioning, health-seeking, self-policing subjects. In Bashford's view, this schema is simplistic. She holds instead that spatial strategies have been part of the public health project at all times, whether implemented through coercive, voluntary or educational means. Only the emphasis placed on such strategies has varied. She suggests that spatial management remained at the heart of public health throughout the twentieth century.

Looking in particular at the emergence of public health in Australia, Bashford concentrates on how smallpox, tuberculosis and leprosy were managed there. Along the way she throws light on the importance of boundaries in separating the pure from the impure, noting that as, during the nineteenth century, vaccination appeared on the horizon of preventive care, such boundaries were conceived in terms of the most immediate barrier keeping infected bodies away from the uninfected self – the skin. Even when vaccination began to be accepted as the only effective mode of smallpox prevention, and spatial segregation of victims of the disease was on the decline in Britain, this was not the case in Australia and other parts of the empire. Indeed, during the 1881 smallpox epidemic in Sydney, spatial isolation of smallpox victims received legal sanction. During this period of compulsory segregation, Bashford suggests, the camps simultaneously served as spaces where values preserving health were internalized and thus conduct modified.

The management and control of tuberculosis and leprosy involved similar segregative practices. However, the racial context of these diseases added a further dimension to the separation of the healthy from the unhealthy. In the case of tuberculosis, which was mainly seen as a 'white' disease, the isolation of patients to sanatoria was voluntary, whereas for leprosy, thought to derive from the Chinese immigrants and the aboriginal population (and therefore not originally 'white'), segregation of sufferers was compulsory, even when the rest of the world was moving away from forced segregation of victims. The racialization of leprosy manifested itself most completely in the establishment of a 'Leper Line' across which the movement of aboriginals was

curtailed. In the last chapter of her book Bashford argues that lock hospitals for venereal diseases also functioned as native reserves. Hence, she writes, 'the spatial projects of health and race became almost indistinguishable' (p. 106).

For Bashford, health and racial management, so tightly mapped onto each other, were also inextricably linked to the formation of the Australian nation, itself conceptualized in terms of 'whiteness'. She notes that in 1901, when the Commonwealth of Australia came into being by the joining of the six colonies, the only public health power that was constitutionally granted to the commonwealth was that of maritime quarantine. The execution of the quarantine policy was informed by the idea that outsiders of other races posed a threat articulated in terms of disease. As Bashford notes, that quarantine created the geo-body of the twentieth-century Australian nation. She claims that Australian nationalism and public health policy, predicated on ideas of 'whiteness' and 'purity' respectively, informed and shaped each other substantially. She goes on to argue that the racial logic informing quarantine measures continued to be reflected in the immigration policy of the nation even in the twentieth century.

While Bashford's book provides a very interesting overarching historical narrative of how spatial management of health and race were central to the process of nation-building in Australia, her argument is, it should be noted, neither entirely original nor entirely borne out by the evidence. Rather, the argument appears to be preconceived and historical data to be sought with the specific aim of supporting the hypothesis. The use of social-sciences jargon and a convoluted writing style do not make for an easy read. Finally, since Bashford's primary area of concern is to explain and account for the development of colonial public health policy and its relation to nationalism in Australasia, *Imperial Hygiene*'s geographic scope is insular and inward-looking, leaving the imperial context unexplained, if not absent.

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John Krige and Dominique Pestre (eds.), **Companion to Science in the Twentieth Century.** Routledge World Reference. London and New York: Routledge, 2003. Pp. xxxv + 941. ISBN 0-415-286065-9. £26.99 (paperback).
doi:10.1017/S0007087406418276

First published in 1997 as *Science in the Twentieth Century*, this new paperback edition faithfully reproduces the contents of the original hardback, save for the addition to the title of the prefatory *Companion to*. The change makes the educational purposes of this book more explicit, in a bid, no doubt, to reach out to those scholars who seek to specialize in the history of contemporary sciences, but who missed the book the first time around. The twentieth-century sciences, as the editors tell us, are taken here to be the outcome of a complex of actors, relations and institutions, developing in the context of ever more comprehensive globalization. Contributors seek to take account of, among other things, increased specialization across scientific disciplines, the growth in size of laboratories and scientific communities, and the tightening of links between science, government and industry. The task appears as important as it is imposing.

Deliberately, the forty-six chapters provide an impressionistic sketch of major scientific developments without, however, analysing individual aspects in the way that an encyclopedia would. They reveal hidden connections and help construct 'big pictures', but do not furnish the reader with specific details to fill in an established interpretative framework. This limitation is at the same time the *Companion*'s strength, as it offers readers the opportunity to explore, without getting bogged down in, a truly impressive array of innovative historical investigations. At times, indeed, the variety of approaches can be bewildering. For example, the three introductory chapters, on 'images of science', seem to have been conceived with radically different agendas in mind.

The first concentrates on the professionalization of historians and sociologists who, especially in the US, have established the study of contemporary sciences as an academic discipline. The second looks instead at the changing meaning of science in the twentieth century. The third, meanwhile, considers whether sexism underlies the development of certain disciplines. Taken separately these are all very interesting. But only the first and third attempt to flag up the political implications of studying contemporary history of science, and the implications exhibited in the first are of a completely different nature from those in the third.

As it stands, unravelling this diversity of approaches and interests could be overwhelming to the reader. A more uniformly designed section would have made for a better introduction to the rest of the volume. The four sections that follow examine, respectively, individual disciplines and their relationships with society and the state, specialization in science, experimental practices and regional and national contexts. It is less the individual chapters than the inter-thematic combinations that offer true 'companionship' for the reader interested in the history of the twentieth-century sciences. Anyone seeking to find out more about the history of transistors, for instance, can here learn of how transistor research was linked to wider changes in science and industry (Chapter 12), the establishment of electronics as a scientific discipline (Chapter 14), the new requirements of the military in the Cold War (Chapter 29), the development of new instrumental practices in post-war physics (Chapter 38) and the specific changes in the US scientific environment in the relevant period (Chapter 42).

Just how effective has this volume been since its original appearance nine years ago? An informal survey shows it to be cited as a general reference in twenty introductory courses in America and Europe, with 'peaks' in the US, Britain, Germany, Canada and Switzerland. Specific use of individual chapters seems to be less uniform. Only four chapters are repeatedly cited as references in courses on the history of twentieth-century biology, science and engineering, and computer science. In research as distinct from teaching, the case is slightly different, with citations of individual chapters being more varied. On the whole, then, the book's widespread uptake shows that it has already fulfilled its main purpose of 'accompanying' scholars and young entrants to the field in their formation and specialization. Thanks to the new paperback version, it will very likely continue to do so in the years to come.

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Helmuth Trischler and Stefan Zeilinger (eds.), **Tackling Transport.** Artefects Series: Studies in the History of Science and Technology. London: Science Museum, 2003. Pp. vi + 186. ISBN 1-900747-53-7. £21.95 (paperback).
doi:10.1017/S0007087406428272

This book makes vivid the divide that separates the activities of museum academics from those of museum curators. On the one hand there is a need to theorize, to muse upon and to conceptualize the meanings of things in museums, especially if they are large artefacts such as locomotives, cars and aeroplanes. But someone still has to take on the job of finding the cash to display them, laying the stuff out, pinning labels on them, checking the heating is working and opening the doors to the public.

The editors of this volume recognize this theory–practice divide but do little to resolve it or build bridges over it. *Tackling Transport* is accordingly split into two halves, with the first six articles being academic essays and the last three exhibition reviews, but the word 'review' does not sit comfortably here since all three are written by senior curatorial staff about their own museums. In effect they read as bullet-pointed brochures or business plans for new exhibition spaces by curators seeking to impress potential visitors and funding agencies rather than to

provide balanced independent critiques. None of them is grounded in detailed scholarly references. They are the sort of presentation one could imagine sitting through at a conference on transport history. This volume is, apparently, made up of papers from one such meeting, but it is not clear which one, or when it took place. The only clue is in a footnote which informs the reader that the conference took place in the Deutsches Museum.

The six academic essays in the first half make for insightful reading but lack the cohesion to push the debate on representations in transport history further forward. Gijs Mom examines the evolution of car parts, Michael R. Bailey and John P. Glithero deconstruct the *Rocket* locomotive, Kurt Möser looks at car interiors, Peter Lyth reflects on competition between US and UK aero-engine makers, Andrew Nahum charts the brain-drain of German aeronautical scientists to Britain after the Second World War and Colin Divall outlines the origins of public displays of transport in Western Europe. Some of these authors have published broadly similar pieces previously as journal essays or book chapters. Indeed the *Journal of Transport History* ((2003), **24**, 2) bears a passing resemblance to this current volume, while Bailey and Glithero's excellent full-length micro-examination of George Stephenson's *Rocket* locomotive is far superior to their cut-down version presented here (see Michael R. Bailey and John P. Glithero, *The Engineering and History of* Rocket: *A Survey Report* (London, 2000)).

Whilst academics investigate the philosophy of the postmodern view that transport artefacts are part man, part machine, curators have to cope with the practical aspects of displaying these large lumps of (mostly) metal. This is the dichotomy that this volume fails to rationalize. As you read it, be aware that it is really two collections of conference papers in one. Be aware, too, that your reviewer has an interest to declare. At the time of writing, I am carrying out doctoral research at the Institute of Railway Studies and Transport History, part-funded by the National Railway Museum, sister organization to the Science Museum, London, which published *Tackling Transport*.

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Chris Feudtner, **Bitter Sweet: Diabetes, Insulin, and the Transformation of Illness.** Studies in Social Medicine. Chapel Hill and London: University of North Caroline Press, 2003. Pp. xxiiii + 290. ISBN 0-8087-2791-6. £22.95, $29.95 (hardback).
doi:10.1017/S0007087406438279

In our more Old-European moments, we Brits sometimes like to flatter ourselves that, whatever else the Americans may be good at, they don't do irony. Chris Feudtner's superb history of insulin and diabetes gives the lie to that conceit. His book is a consummate study in irony, in the classical sense of the dramatic unfolding of tragic consequences from apparently benign events. Feudtner deliberately adopts the ironic mode in place of the heroic narrative of modern medical advancement within which the story of insulin is usually framed. First isolated in 1921, the hormone was quickly hailed as a sensational, almost miraculous, cure for the hitherto fatal and harrowing disease of diabetes (more specifically, juvenile-onset diabetes). This view has persisted ever since, incorporated into what Feudtner argues is a mythologized account of the unequivocally beneficial effects of medical science and technology on human life. The reality, as Feudtner makes clear, is much more complicated.

For one thing, advances were already being made in the treatment of diabetes even before insulin came on the scene. In particular, innovations in dietary management of patients had extended the average survival after onset of the disease from five years in the period just before the First World War to a little over six years in the period from 1914 to 1922. The advent of insulin contributed to this process of prolongation of diabetic life, which increased to an average of eight

years in the period from 1922 to 1929, and continued to be extended thereafter by further improvements in the management of diabetic patients (pp. 17–21). For all the drama of its introduction, then, insulin was far from a miracle cure. Rather, it was one element in a much more protracted transformation in the nature of diabetes. From being a disease of relatively rapid decline and death, diabetes gradually became a chronic condition whose sufferers had a reasonable hope of living as long as the rest of the population.

But increasing longevity captures only one aspect of the multidimensional transformation that diabetes underwent over the course of the twentieth century. The majority of Feudtner's book is devoted to fleshing out other aspects of how diabetes and, more generally, the lives of those who suffered from the disease were transformed in the years after insulin appeared on the therapeutic scene. Feudtner bases his analysis on the wonderful collection of patient records meticulously compiled by pioneering diabetologist Eliott P. Joslin, who ran a clinic for diabetics in Boston, Massachusetts from the turn of the twentieth century until his death in 1962. This archive, which includes not just medical records but also patients' letters, poetry and cartoons, provides the material from which Feudtner paints a series of beautifully rounded, humane and moving portraits of the lives lived by Joslin's patients. It is here, above all, that the ironies inherent in the transformation of diabetes become fully apparent. The prolongation of diabetic life has not been an unalloyed benefit. At best, it has been achieved at the cost of constant self-discipline and self-control in the face of a perpetual threat of complications and side effects – what Feudtner calls a state of 'dangerous safety' (p. 169). And, for many, this precarious and onerous life has been further marred by frustration and anger, disability and premature death. For all that medical control of the disease now intrudes into every corner of the diabetic's life, it is at best only partial, and may bring its own malignities to add to the burden of chronic illness.

Readers of this review might by now be wondering whether to write Feudtner off as a cynical detractor from the obvious benefits of scientific medicine – one of the anti-scientific awkward squad who have supposedly infiltrated history of science in recent years. He is no such thing. Feudtner is a practising paediatrician, specializing in tackling the problems faced by children with chronic health problems, including diabetes. His writing is motivated by his own professional experience of how heroic myths of technological mastery over illness not only obscure the complex reality of such problems, but also undermine his own and others' efforts to alleviate them. Technology has its part to play in the work of caring, but the relationship between the implementation of technological control and the fulfilment of individual life and potential is not a simple one. As a medical humanist, Feudtner ultimately takes the view that the unique and inevitably ironic narratives of individual lives must take precedence over the myths of technology triumphant. The lives that he so tellingly recounts in *Bitter Sweet* are eloquent testimony to why that must be so.

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Sonu Shamdasani, **Jung and the Making of Modern Psychology: The Dream of a Science.** Cambridge: Cambridge University Press, 2003. Pp. xvi + 387. ISBN 0-521-53909-9. £18.95, $28.00 (paperback).
doi:10.1017/S0007087406448275

This is a major work in the historical restoration of Jung's 'complex psychology' (the term he preferred to 'analytic psychology'), of the intellectual culture out of which it came and of the context in which it sought an audience. There is need for such a study because there have been so many, such varied and, at times, such false claims about 'Jungian' thought and therapy – a pile of baggage belonging more to a morally stunned twentieth century than to one man. The book is the

result of twenty years of painstaking research on archival materials (many previously ignored or misused), access to private documents, disciplined reading over the extremely wide context of Jung's writing, and an intelligence very sceptical of received wisdom. It indubitably establishes a new reference point for understanding Jung. For anyone, whether specialist or non-specialist, interested in his place in science, this is the text.

The book is a study of the nature of Jung's theory of psychology, which he consistently planned and thought of as a science. Though it is meticulously informed by biographical knowledge, it is not a biography – most evidently in the way the book does not have a narrative form given by the life. It describes Jung's science, and explains why it has the form that it does, by making four cross-cutting sections, in different dimensions, across the work: 'The individual and the universal', 'Night and day', 'Body and soul' and 'The ancient in the modern' (Sonu Shamdasani's own metaphor for this form is cubist painting). As both the title and the introduction of the book make clear, this is a study of Jung's attempt to make a unified science of psychology, why he did not succeed and, more broadly, how this failure shows that 'psychology' was, as it remains, an incoherently related cluster of theories and practices.

Shamdasani goes out of his way to introduce some basic lessons from recent rethinking of the history of psychology in his introduction, and this suggests he very much seeks to interest 'the general reader' along with psychologists ignorant of history. But then his non-narrative painting of the sources, content and reception of Jung's thought tends to presuppose previous familiarity with Jung as a subject. At times the author's intimate knowledge of what other accounts of Jung have ignored or distorted (for example, the wealth of nineteenth-century material on dream interpretation, the libido or collective psychological ideas), rather than what a 'general reader' might first need to know, actually structures the text. There is, notably, a stress on finding a framework other than that given by Jung's relationship with Freud. There are highly informed discussions of connections to such figures as James, Flournoy and Bergson. But it does appear to be a major practical problem in the history of psychology to know how to do justice to its vast intellectual, practical and spiritual context without descent into a catalogue of ideas or detail whose significance only a few specialists will see.

The four extended sections across Jung's science are extremely rich. Jung's starting point was the conviction that psychology as a science must underlie all the sciences, since, in his view, without knowledge of 'the personal equation' we cannot establish objectivity. He attempted to establish systematic knowledge of this personal equation, creating a typology of human character. Shamdasani's first chapter, which discusses this, goes directly to reasons why Jung is both so cited and so controversial: he validates the personal meaning that experience has and, by doing this, raises in acute form the whole problem of what it is to achieve objectivity. In 'Night and day' Shamdasani places Jung (and indeed Freud) back in the tradition of dream interpretation and the prophetic and therapeutic practices to which it belonged. The long chapter on 'Body and soul' relates Jung to biology, physiology and experimental psychology at the turn of the twentieth century. This makes it possible to assess the sense in which Jung thought his project had scientific standing and the manner in which the biological and psychological sciences developed away from that understanding. Jung was left with the pragmatic assertion that ideas with the power to change people's lives cannot be wrong. The fourth chapter or section covers Jung's relations with anthropology and his much criticized but unshakeable belief in a shared primitive collective unconscious. A most interesting insight concerns Jung's view that the objective reality of the collective unconscious is the only grounds on which to base a reconciliation of individual and collective (political) life. This goes a long way to explaining how and why people transformed his work into a social, therapeutic and even redemptive movement. Jung, as the author makes clear, resigned himself to, but hardly favoured, the setting up of Jungian schools and institutes. But it is not clear what way ahead he offered besides the hope that a small elite, able to appreciate

'the personal equation', would offer guidance to the masses dominated by the primitive collective unconscious.

This book splendidly pushes aside both adulatory and debunking studies of Jung and presents his thought in all its fascinating complexity. It is both the starting point for future work on its subject (on which Shamdasani himself clearly has much more to say) and a challenging portrayal of the tragedy of 'the dream of a science' which belongs to an age and not to Jung alone.

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WALTER A. ROSENBLITH (ed.), **Jerry Wiesner: Scientist, Statesman, Humanist: Memories and Memoirs.** With a Foreword by Edward M. Kennedy. Cambridge, MA and London: MIT Press, 2003. Pp. xxiv + 612. ISBN 0-262-18232-7. £22.95 (hardback).
doi:10.1017/S0007087406458271

Jerome Wiesner was president of MIT in the 1970s when he helped to found its Program in Science, Technology, and Society. As a faculty member and, currently, director of that program, I therefore expected to be interested in and to like this book about Wiesner. I never expected, however, to be so thoroughly interested and to like it so much. The first half comprises 'memories' of Jerry (as everyone writing calls him) by an all-star line-up ranging from Senator Edward Kennedy, to the legendary documenter of American folk music Alan Lomax, to the Nobel laureate economist Robert M. Solow. The second half is composed of 'memoirs' by Wiesner himself: fragments of autobiography composed after his 1989 stroke (his son Josh was crucial in helping get them written down), as well as speeches, letters and papers. The volume also contains a wonderful selection of photographs, a detailed chronology, a note on sources and other useful scholarly tools.

The book is woven around three threads: science, politics and education. Wiesner spent most of his professional career, in his own words, 'understanding, building, or encouraging the implemention of communication and information processing systems' (p. 491). This career took him from studies in mathematics and communication engineering at the University of Michigan (where he also ran the university broadcasting studios and worked in a speech laboratory with deaf children), to work on radar systems in the Second World War, to research on noise and signal detection problems using the Whirlwind Computer ('We were making a timesharing system but didn't realize it'; p. 493), to studies in the transmission of electrical impulses in the nervous system. From radio to neuroscience, his scientific career was all about human communication systems.

Wiesner's political activities began with his work on radar and other technical innovations during the war, but afterwards he turned his attention to the peacetime management of technical innovations through what he called 'good learning systems'. By the late 1950s, he later wrote, efforts to understand and stop the nuclear arms race 'became an obsession for the rest of my life' (p. 244). Accounts of Wiesner's work as an adviser and activist in successive presidential administrations, in non-government organizations such as the Pugwash Conferences, at MIT and among an impressive personal network are some of the most fascinating passages of this book. One of Wiesner's great strengths was his ability to tolerate ambiguity – but in confronting the arms race he was an absolutist. Convinced that the only way to control nuclear weapons was to reduce drastically the number of offensive weapons on both sides, he strenuously opposed any steps in the direction of testing or anti-missile systems.

This took courage. When Wiesner advised President Nixon against pursuing the ABM system, Nixon tried to cut off federal funding to MIT. When Wiesner joined a committee that lobbied against J. Edgar Hoover in a newspaper ad, 'it almost cost me the presidency of MIT' (p. 448), as

a member of the search committee considered this proof that Wiesner was a communist. Fortunately the committee chose him anyway, though only after considerable hesitation and wrangling. What followed was MIT's springtime of educational innovation of the early 1970s, a brief but intense epoch when Wiesner and Walter Rosenblith, editor of the volume, presided over the creation of a host of innovations that are still the pride of the institute: an Undergraduate Research Opportunities Program, health sciences and technology collaboration (with Harvard University), a Council for the Arts, the Media Lab – and the Program in Science, Technology, and Society.

Of all the memorable glimpses of Wiesner provided by this book, the most poignant is one of the last, a diary entry he wrote while recovering from his stroke – the most difficult challenge of his life, he wrote, in understanding and mastering human communication systems. The stroke occurred in January 1989; the following summer, still recuperating, as he was lying in bed in his Martha's Vineyard home, listening to the frogs and the harbour bell, he noticed a 'pulsing sensation in the fingers of my paralysed hand that was synchronized with a slight but similar pulsing on the right side of my head. As I played with it I found that I could make the sensation move from one finger to another'. Even if he could not move the fingers, he deduced there must be some nerve connection there (p. 515). This is a moving image of a scientific life well and fully lived. I like to think it is a metaphor for the possibility of reconnecting scientific understanding with social action.

I do not lament the absence so far of a more 'definitive biography' of the man. I prefer this less filtered project, at once scholarly and engaging, which allows the reader to confront more directly this impressive 'scientist, statesman, humanist'. What I do lament is the dearth of people of such courage, range and integrity, and even more the dearth of institutions to support them. Even extraordinary people will not be effective if they do not have a context within which to operate. Wiesner had the good fortune of operating in institutions like MIT and the Eisenhower and Kennedy presidential administrations. MIT chose him as president despite many anxieties about him, and two American presidents were strong enough to listen his advice even when they did not especially want to hear it. Historians of many varieties will welcome this volume, which provides so much insight into the interplay of individuals and institutions in the evolution of communications science, the politics of science, and higher education during the long Cold War.

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