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Book reviews

BERNARD LIGHTMAN (ed.), **A Companion to the History of Science**. Oxford: Wiley Blackwell, 2016. Pp. xvi + 601. ISBN 978-1-118-62077-9. £120.00 (hardback).
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In the magisterial essay on 'Historiography of the history of science' that opens this excellent new *Companion to the History of Science*, Lynn K. Nyhart observes that while scholars in the field have frequently borrowed methodological approaches from other disciplines, they 'have often shied away from direct theoretical statements in favour of a more empirical style that integrates analytical insights into narrative structures' (p. 8). This tendency to sugar the theoretical pill with narrative often makes history-of-science monographs much more engaging and readable than equivalent academic books in other fields such as literary criticism (and I say this as someone who works primarily in that discipline), but it is necessarily tempered in this *Companion*, for which Bernard Lightman has assembled a superb roster of many of the leading figures in their respective specialisms. The volume's foregrounding of historiography is evident not just in Nyhart's opening overview, but in the very structure of the book. As Lightman notes in the 'Introduction', the *Companion*'s 'object is to survey recent developments that have resulted from the effort to

re-envision the field' in the 1980s and 1990s (p. 2), and it endeavours to do this by largely abandoning the chronological approach adopted in previous surveys of the discipline such as the ongoing *Cambridge History of Science* series (2003–). Instead, Lightman's *Companion* is organized around analytical categories, focusing on four particular areas that have come to dominate recent historiography: (i) 'Roles', (ii) 'Places and spaces', (iii) 'Communication' and (iv) 'Tools of science'.

This structure, with each of these categories comprising a section of around ten chapters, enables the *Companion* to address current issues such as identity, practice, the movement of knowledge, and material culture from a number of different perspectives that, helpfully, are often mutually illuminating. To take only one example of this, while Aileen Fyfe's chapter on 'Journals and periodicals' in the 'Communication' section affords an incisive synopsis of the development and significance of these key vectors of scientific exchange and dissemination, periodicals and related serialized media are also integral to the arguments of several other chapters. They are, for instance, important resources for self-fashioning and the cultivation of careers in the chapters by Valérie Chansigaud on 'Scientific illustrators' and Paul White on 'The man of science' in the 'Roles' section, and conspicuous agents of institutional authority and prestige in Denise Phillips's chapter on 'Academies and societies' and Lukas Rieppel's on 'Museums and botanical gardens' in the 'Places and spaces' section. Indeed, few of the chapters in the *Companion* can really be read in isolation, with, for example, White's superb account of the gendered scientific vocation adopted in Britain and America during the nineteenth century needing to be supplemented by, at the very least, the chapters on 'Amateurs' (by Katherine Pandora) and 'The professional scientist' (by Cyrus C.M. Mody) for its historiographic claims to resonate in a broader context.

With a bracing brusqueness, Nyhart notes that, notwithstanding its 'increasingly sophisticated historiography', much recent work in the history of science, and particularly that on popular science, still retains a 'parochial focus on nineteenth-century Britain' (p. 13). The *Companion*, although edited by a leading specialist on Victorian Britain, largely resists such parochialism, both temporally and spatially. Its focus instead extends from the ancient world, exemplified in Nathan Sidoli's account of 'Learned man and woman in antiquity and the Middle Ages', the opening chapter of the 'Roles' section, to the new frontiers of 'big-data positivism' (p. 472) discussed in Matthew L. Jones's chapter on 'Calculating devices and computers', which, especially when read as part of the 'The tools of science' section alongside chapters on older technologies like microscopes and telescopes, helpfully historicizes the often hubristic claims made for our contemporary digital revolution. In their attention to science as a global phenomenon, the various contributions to the *Companion* almost always move beyond the hoary old unidirectional model of centre and periphery, with Kapil Raj, in an excellent chapter on 'Go-betweens, travelers, and cultural translators', instead emphasizing the 'global *inter*connections, intercultural encounter, and negotiation' enacted by the liminal figure of the 'go-between' (p. 39, original emphasis). Similar arguments are also articulated by Rieppel about European museum collections, which are shown to be products of circulation and mediation, and by Marwa Elshakry and Carla Nappi in their instructive chapter on 'Translations'. The only exception is in Phillips's chapter on 'Academies and societies', where the stringent centralization of Napoleonic France ensures that those provincial scientific institutions far away from the 'powerful center of Paris' remain merely 'voices from the periphery' (p. 230). It is actually rather reassuring that not all of the chapters conform to exactly the same historiographic standpoints, as, inevitably, certain theoretical models will work better for some historical situations than for others. And again this comparative insight into different historical and geographic circumstances becomes most evident by reading the different chapters in the *Companion* alongside each other rather than as self-contained entities.

Although the individual chapters, which Lightman describes as 'synthetic, midscale studies rather than microstudies' (p. 2), are uniformly excellent, the *Companion to the History of Science*, when read as a whole or even section by section, really is more than the sum of its parts.

Gowan Dawson
University of Leicester

William H. Brock, **The History of Chemistry: A Very Short Introduction**. Oxford: Oxford University Press, 2016. Pp. xvi + 151. ISBN 978-0-19-871648-8. £7.99 (paperback).
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The history of chemistry is arguably one of the most challenging subjects in the history of science. Any attempt to give an account of the processes which led to the emergence of modern chemistry at the end of the nineteenth century requires historians to follow the practical and theoretical work of many historical actors who did not identify themselves as chemists, but who were artisans, practising doctors, alchemists and philosophers. The history of chemistry is therefore highly complex, and it cannot be expressed in the form of a linear and coherent narrative. Writing a concise introduction to the subject which, at the same time, should be accessible to the general reader is therefore a task which must not be underestimated. William Brock, one of the most accomplished scholars of the subject, demonstrates with this book that he is more than capable of the task. *The History of Chemistry* does not offer a strict and linear chronological account of the historical development of chemistry. Instead, the work is organized into six substantial chapters on six broad themes. The first three chapters follow different strands of theoretical and practical traditions of manipulating 'stuff', on the one hand, and theorizing about the principles of the transmutation of matter, on the other. The final three chapters describe how these various traditions resulted in the formation of chemistry as a modern scientific discipline, and how chemistry had shaped almost every aspect of human life during the twentieth century.

The first chapter, titled 'On the nature of stuff', traces the origins of chemistry back to the sophisticated metallurgical and glass-making practices of Graeco-Egyptian artisans, expands on the beginnings of metaphysical speculation pioneered by pre-Socratic and Aristotelian philosophers, and explores the lasting influence of the alchemical tradition. Chapter 2, 'The analysis of stuff', takes a closer look at some of the early systematic approaches to the study of the transmutation of matter by following Paracelsus and his school of iatrochemistry, the works of corpuscularist philosophers such as Daniel Sennert and Robert Boyle, and Isaac Newton's mathematical approach toward the study of chemical affinity. Examining the mysterious realm of 'Atoms and gases', Chapter 3 highlights the context in which the conceptual and experimental foundations of modern chemistry were laid by Antoine Lavoisier's investigation of oxygen, and John Dalton's atomic theory and relative atomic weights. Concluding this chapter, Brock points out that the Chemical Revolution was a continuous process characterized by not only conceptual, but also significant instrumental and institutional, transformations. Chapter 4 is titled 'Types and hexagons', and covers the contributions of nineteenth-century organic chemists toward the creation of new models and theories of the constitution of organic substances, as well as the creation of an economically significant chemical industry. The chapter concludes by highlighting the emergence of a new order of chemistry brought about by the structure theory, a revised nomenclature and the universal symbolic language of structural formulae. Chapter 5 is called 'Reactivity' and elaborates on the emergence of the subdiscipline of physical chemistry. The chapter shows how scientists began to think of chemical reactions of different kinds in terms of energy and equilibrium, and to express the physical properties of substances in algebraic and geometric terms. This, together with the introduction of new techniques such as spectral analysis and mass spectrometry, has led to a better understanding of the forces that keep atoms together in a molecule, and made the study of chemistry 'much more mathematical' (p. 100). Focusing predominantly