

Animals and publication come together neatly in Chapter 4, devoted to the *Histoire des animaux*, a large and expensive work that described more than thirty dissected animals from the king's menageries. Its beauty and its many engravings were a testimony to the glory of the king, and its inclusion of both the anatomical details and the natural history of the animals involved neatly encapsulates Guerrini's concept of the co-development of the two in seventeenth-century Paris. The principles behind its production also reflected the policies of credit adopted by the academy.

In Chapter 5, Joseph-Guichard Duverney emerges as an important figure in the next generation of academy members. Animal dissection and an interest in their natural history (including exotic animals like the ostriches at Versailles) continued to be important, as did the development of more material for the *Histoire*, but with Duverney the important idea of animal mechanism also became prominent, as did the venue of the Jardin du roi where Duverney taught for nearly forty years (which is described in detail in Chapter 6). Publication procedures also began to change as the ideal of suppressing individual credit started to fade and the further printing of editions of the *Histoire des animaux* suffered, both from financial problems and from Duverney's conflicts within the academy, which he eventually left, taking the manuscript of the *Histoire* with him.

As Guerrini describes in the epilogue, beginning in the 1730s, after Duverney's death, the publication of the *Histoire* was revived and new editions were printed. The *Histoire* and the anatomical projects of the academy, including its supply of exotic animals, had always depended heavily on patronage, and when the king's interest waned, so did they, but their effects lived on. Anatomical study became a science in the seventeenth century, one that accepted dissection as a source of new knowledge. *The Courtiers' Anatomists* tells the tale of how this happened in early modern Paris in a rich narrative encompassing all of the actors, from ostriches to kings, who played a role.

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JAMES Q. DAVIES and ELLEN LOCKHART (eds.), *Sound Knowledge: Music and Science in London, 1789–1851*. Chicago and London: The University of Chicago Press, 2016. Pp. 257. ISBN 978-0-2264-0207-9. \$55.00 (cloth).
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Though the subtitle of *Sound Knowledge* highlights the historical cross-influences between music and science, they are strongly joined in this collection to a third interest: the history of the senses. The contributing authors explore how sonic practices informed the structures of knowledge in emerging disciplines across the sixty-year time frame in focus here, and they pose a collective discussion around the question 'what kind of object was music understood to be[?]' (p. 19). This query sets up a particular kind of sensorial dance through the topics explored, highlighting tensions between excitement and anxiety, and between the material and the immaterial. The experimental and experiential approaches to music and sound, and the cultural resonances that are described, are complex. New scientific practices and inventions show their designers probing sensory thresholds – musical demonstrations and machines opened up the imagination for the application of phenomena to a range of new technologies that extended human sensory capabilities, i.e. long-range communication. The stage is London and the performance is the promotion and the consumption of knowledge, the wondrousness of new technologies and the metropole's relationship with global empire (James Davies, Flora Willson); the object-ness of music also extends well beyond the tangible.

The collecting of experiences and things and their investigation are kept in focus throughout, from Charles Burney's critical observations of musical phenomena across Europe (Emily Dolan) to the 1851 Great Exhibition (Willson), with no slight passing by celestinas or enchanted lyres (Deidre Loughridge, Myles Jackson, Melissa Dickson), engines and noise (Gavin Williams), and

stage performances that featured sound and light analogies or the galvanizing of Frankenstein and what it meant to cultivate sensory awareness (Ellen Lockhart, Sarah Hibberd). Collection was important, as it was no longer the sole province or passion of the noble or wealthy merchant for the enjoyment of a select few, but rather a project of empire, asserting national identity and pre-eminence in the global context.

Curiosity and experiential enquiry inspired a broad approach to investigating how sound could be shaped and transmitted. Instruments are not studied in these chapters for their specific acoustic properties (though some of this is covered in the process), but rather for their employment in demonstrating sonic phenomena that illuminated how energy communicates from one point to another and how resonance could be constructed, enhanced and explained, and as part of understanding, duplicating and contesting the multiplicity of tuning and scale systems extant across the globe. One of the discussions of particular interest covers tuning systems (Davies) and the promotion of a keyboard-style mechanism in experimental instruments. Nineteenth-century challenges to the Western equal temperament tuning system that had been developed during the eighteenth century (and dominated keyboard tuning) are rarely presented in texts aimed at music students, and yet the issue figured into debates over what was 'natural' about a musical scale in the nineteenth century: there was vociferous debate between those arguing that the Western scale was not of greater value than others and those vaunting the superiority of the Western scale that had much to do with the project of empire, and of practicality.

These scientific performances occurred in London at a time when there was increased public interest in the elucidation of mechanical and material processes. The public lecturer became an important figure in moulding public perception of new knowledge and how that knowledge is obtained. Like the keen uptake in the preceding century for the public concert, the series of subscribed lectures on various subjects was something that appealed to a fairly broad subset of London's population, and the venues grew in proportion to their popularity. Speculative knowledge is not ignored by the authors where relevant, but demonstration through observation assisted by musical instruments is the main focus. Scientific presentations were performances, calculated to tantalize the sensory notions of the audience. The public perception of empirical knowledge was shaped, then, through the strong appeal to visual and auditory phenomena and, as several chapters emphasize, lecturers were not above the illusion and sleight of hand we associate more with the magician if it served their purpose to both explain and astonish (and sometimes more the second than the first). For this element, we need look no further than the examples of Walker's Eidouranian or Wheatstone's Enchanted Lyre.

Moving into mid-century, Romantic sensibility increasingly accentuated the immaterial and transcendent qualities of instrumental music (one was transported by it, and by highly emotive performances by the virtuosi too). At the same time, as this volume observes, the acoustic phenomena that created that sound were increasingly demystified. Enchantment and disenchantment were set in collision and collaboration, and elaborated in discrete arenas – the concert hall and the lecture hall. In this environment, the composer became, in a sense, the now out-of-date alchemist who could transform the raw sentiment of his audience into a spiritual experience, and the scientist (the natural-philosophical descendant of the alchemist) rendered musical knowledge into quantifiable measurement and demonstrable material properties.

The ground covered here is not new; a number of these cases have also been examined in other recent work, among them Peter Pesic's *Music and the Making of Modern Science* (2014). What the present collection offers, however, is detailed description of the experiments employed and their broader cultural implications around a discrete place and time – early nineteenth-century London. *Sound Knowledge* grapples with the continuities and disruptions in how instruments were conceived and used (from natural-historical description, to agents of empire, to demonstrations of technology and productivity), and what that meant for the social and political formation.

New sounds created new sensory experiences and interpretations of sensibility; they produced new economies of listening and brought about the comparative valuation of expert versus street spheres of knowledge. They also put into question what was ‘natural’ about sound and its perception. And all is situated in the context of an empire extending its global reach and influencing, as well as being subject to the influences of, soundings far and near. This collection would be interesting for readers across several disciplines dealing with sound and the historical period. The chapters are generally well written and accessible to a broad readership, and they would be useful for the university classroom as well as for those working across the various disciplines engaged.

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ANNIE TINDLEY and ANDREW WODEHOUSE, *Design, Technology and Communication in the British Empire, 1830–1914*. London and New York: Palgrave Macmillan, 2016. Pp. 131. ISBN 978-1-1375-9797-7. £37.99 (hardcover).
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This is a short book about engineering in the British world throughout the long nineteenth century. The ‘British world’ refers not only to imperial territories, but also to the interconnections with nations that contributed to Britain’s engineering industries while remaining external to empire. The aim of the Palgrave Pivot series in which it is published is to offer an alternative form of publication for authors whose argument cannot be condensed into a journal article, but does not require or lend itself to expansion as a traditional monograph. This format is well chosen for these authors, the one a historian and the other a lecturer in design. The idea for the organization of their materials is pithy, breaking down sets of historical activity according to four ‘stages of design’ – identification, specification, conceptualization and production – each of which is afforded its own chapter. If they had chosen to expand this range of categories to include more of the abstract terms in which design theorists understand their industry, with the aim of producing a full monograph, the exercise would probably have lost its sparkle. As it is, these categories provide a helpfully fine-grained way in which to appreciate select aspects of engineering method and business practice. I do, however, think that the book would have benefited from at least one more chapter, to clarify the historiographical role of design thinking, for reasons which I address below.

Historiographically this work is positioned amidst literature on industrialization, empire and the history of economics. The cases that these authors explore, which include steam-powered ploughs in Egypt, sugar processing plants in the Caribbean and mechanized sheep-shearing in Australia, amongst other things, are all of direct interest to historians currently investigating colonial economics and administration, interconnections of technology and the environment, and agricultural industrialization. An emphasis on communication also makes this a handy volume for those pursuing the circulation of knowledge within and beyond empire, though I should admit that the role the authors see for design as a ‘conduit for communication’ (p. 3) was never clear to me. The claim is a very crucial one for the authors, who use this phrase repeatedly and pointedly. For myself, that the pursuit of design created many demands for communication is straightforward, as is the idea that communication requires material things, and that joint ventures produce a community of communicators, but ‘conduit’ always seemed to suggest something more.

Such a short book has limited space for scene setting, and so they rely heavily on citations to more expansive works to provide historical background and trajectory. Three in particular are worth highlighting: Adas’s *Machines as the Measure of Men: Science, Technology and Ideologies of Western Dominance* (1989), Cain and Hopkins’s *British Imperialism: Innovation and Expansion, 1688–1914* (1993), and Magee and Thompson’s *Empire and Globalisation: Networks of People, Goods and Capital in the British World, c.1850–1914* (2010). In order to