'Lectures on gas theory (1896, 1898)'. Following Boltzmann through this work, paper by paper, the reader gets a very different sense of the man and his science than that provided by the *Lectures on Gas Theory* and his later philosophical writings, which tend to be his most-read works today. Darrigol's argument that familiarity with these more popular works alone has led to an incomplete and sometimes inaccurate view of Boltzmann is amply demonstrated for the reader willing to follow him through the twists and turns of the papers themselves.

The exegesis proper constitutes the bulk of the text at 390-odd pages, but is supplemented by two introductory sections that fall under Part A, 'Preliminaries'. The first section is a sketch of Boltzmann's life and works with an emphasis on the 'works' side of the equation. Even this biographical thumbnail is not for those unfamiliar with mathematical physics as equations feature heavily here as well. The 'Life and works' section is followed by perhaps the best short account of the development of nineteenth-century theories of heat I have seen, and some readers might profitably read this section before the 'Life and works' that precedes it. Both of these preliminary sections make for good reference points for what follows in Part B, the exegesis itself.

Darrigol closes the volume with Part C, 'Synthetic reflections', which is the fruit of the seeds planted in the exegesis. Here he makes an argument for a unified conception of 'Boltzmann's theory' despite the varied nature of his work. This variety is amply demonstrated by Darrigol's enumeration of the five different foundations of kinetic-molecular theory that Boltzmann relied upon in the course of his work (p. 565). Darrigol outlines a set of theoretical 'bridges' that Boltzmann employed to connect his many different approaches, arguing that 'even the most remote parts of Boltzmann's theory appear to be interconnected' (p. 567). Because the reader has followed Darrigol through Boltzmann's work in such detail in the exegesis, they are familiar enough to be able to see 'Boltzmann's theory' as 'a tightly connected network of theoretical endeavours, with diverse but ultimately compatible foundations' (p. 567). The journey allows the reader to clearly understand the destination, where Boltzmann's pluralistic ideal of scientific approaches reflects the pluralism 'within his own theory' (p. 567).

Darrigol has created a book that will obviously appeal to experts in the history of modern physics; it will become required reading. But I think this book will also prove extremely valuable in graduate student education as well. Working through this book is an experience. It demands slow, careful reading, but it is extremely rich and rewarding. This would be an ideal text to work through in a seminar on the history of modern science, providing the students have the appropriate background in mathematics, and it should certainly be on reading lists for doctoral exams in the histories of physics and mathematics, both for its enlightening content and for its enlightening approach.

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Laura J. Miller, **Building Nature's Market: The Business and Politics of Natural Food**. Chicago: The University of Chicago Press, 2017. Pp. 288. ISBN 978-0-22650-123-9. $105.00 (cloth cover).
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Although market forces have become increasingly pervasive, many people continue to believe that certain objects and relationships should not be subject to the logic of supply and demand, because they either embody higher cultural values or are vital for sustaining life. In an earlier book, *Reluctant Capitalists: Bookselling and the Culture of Consumption* (2006), Laura J. Miller explored the historical dynamics between independent booksellers and large chains and showed that books are still seen by many readers to have an extra-commercial status. In her new book she now examines the role of natural foods in the capitalist marketplace and how producers and retailers of such foods attempt to align – or not – their ethical impetus with their aim to attract more buyers of their products and to make their efforts into a sustainable business.

One feature of those critical of how food is produced in the modern world is that they are often themselves involved in commercial endeavours tied to producing and selling food. Like organic agriculture, the natural-food movement has, from its beginning, also been a business while retaining a critique of the corrupting influence of commercialization. Miller traces the history of the natural-food movement in the United States from its beginnings, when ideas about diet were associated with an understanding of what it means to lead a Christian life. The earliest proponents, such as William Metcalfe (1788–1862) or Sylvester Graham (1794–1851), did not produce any commercial products themselves, but many of their followers – especially in cities – took the first steps by establishing boarding houses or dining rooms and also started to distribute health foods. Only at the end of the nineteenth century, the first successful attempt was made to commercialize natural foods in a Seventh-Day Adventist Sanatorium in Battle Creek, Michigan, under the direction of John Harvey Kellogg (1852–1943). With Kellogg, who increasingly distanced his products from religious connotations, natural foods began to appeal to a wider range of consumers. Kellogg and other entrepreneurs established a niche market for lifestyle products, which then started to raise questions about the moral status of markets. The natural-food movement proved to be quite flexible in the coming decades. While, in the nineteenth century, there was a tight match between the philosophical and religious foundations of the movement and the convictions of the buyers of the food, this link became more and more tenuous. This became obvious quite starkly in the 1950s when Hollywood stars and bodybuilders showed that the consumption of health foods was perfectly compatible with a glamourous lifestyle. In Europe, Demeter presently is a major producer of organic and health foods, but only a small minority of buyers share – or are even aware of – the rather esoteric philosophy of this organization. Modern consumers of health and organic food base their choices more on an assessment of personal risks and on broad political convictions than on adherence to a specific philosophy. Miller believes that consumers can indeed exert significant influence and that their choices can be a vehicle for broader social and cultural changes. She is confident that the integration of the natural-food movements into markets does not necessarily compromise their long-term, moral objectives.

While Miller does not primarily address historians of science, the natural-food movement has always been abuzz with terms, concepts, ideas and practices, which should give historians of science plenty to think about and to work with. Some precepts of the earliest, religiously motivated natural-food movements stated that food should be simple, 'natural' and as little processed as possible. This raises questions such as what food processing means. Preserving, cooking and baking are among the oldest food-processing technologies, which are needed to make certain foodstuffs durable, edible and digestible, and John Harvey Kellogg employed this grey area between minimal necessary and extensive processing to promote highly processed health foods, such as meat substitutes. Kellogg claimed that all the ingredients were impeccably natural and that the processing prepared the food optimally for the human digestive tract. The movement has also nurtured throughout its history scepticism towards 'mainstream' science and has frequently given a home to practices which are often quaint and harmless, but sometimes can be dangerous, such as anti-vaccination efforts. These examples show the value of food for historical study – ranging from studies of its materiality to what food represents about the modern world or about an imagined past.

What is missing from Miller's study is more detail about the often atrocious practices of conventional food production in the nineteenth and early twentieth centuries: adulterated milk made to look white with plaster of Paris or chalk and preserved with formaldehyde; fake honey made of coloured corn syrup; fake strawberry jam containing only mashed apple peelings, grass seeds and red dye; or flour routinely extended with crushed stones or gypsum. These apparently widespread practices shed a different light on the activities of the first proponents of natural foods. While they framed their motives often in purely moral and religious terms, they had identified

serious issues and come up with solutions long before official authorities acted. Moral crusaders sometimes do indeed prefigure the shape of things to come.

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DANIEL WARNER, **Live Wires: A History of Electronic Music**. London: Reaktion Books, 2017. Pp. 208. ISBN 978-1-78023-824-1. £16.00 (cloth cover).
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This concise history of electronic music caught my attention, since I've always used examples from history of music in my history-of-computing course, as these offer such nice examples of the far-reaching consequences of the rise of the digital age. *Live Wires* offers much information and a great narrative on the history of electronic music. In five chapters, the author treats five different technologies that shaped modern music: the tape recorder, circuits (synthesizers, mainly), the turntable, the microphone and the computer. Reading Daniel Warner's book made me aware of the potential music has in researching cultural changes due to technology, which reaches beyond what I had been teaching up to now.

If you pick up this book, you'll surely read about the music of your youth (and afterwards), and learn that there was more to it than you might have expected. Not only did I come across more electronic influences than I was aware of; composers, musicians and the audience (or the listeners) have all fundamentally changed their ideas about music over the last century. Warner makes you aware of these changes in his fluent and catchy style, offering a lot of detail, on both the technicalities and the social context. The details he includes serve a clear purpose, and although the structure of the book implies that some names will pop up in most chapters, that didn't bother me. It might, as I experienced, make you reread earlier paragraphs now and then, to remember the chronology of events. I particularly enjoyed the 'Recommended listening' list, an addendum which delayed the writing of this review for several weeks.

There are three critical remarks to be made. First of all, Warner takes the technological changes in music production as a guiding principle in his history. While I agree with him, that you can't discard the technicalities in this history, he takes this to an extreme, by making technological developments the core of his account. Sometimes the technology itself is even taken for granted, as if the ideas underpinning it were obvious and just waiting for realization. Certainly with the computer this has not been the case: all kinds of people were appropriating these machines for their purposes and it was their success, or lack thereof, that stimulated industrial production of machines. Warner's book offers stories about how the microphone and other technologies were adopted by a variety of musical (sub)cultures, who were not necessarily in touch – in some cases weren't even aware of each other's existence. One may also read how, sometimes, these technologies were experimented on by musicians or composers striving for a particular effect, thereby creating or initiating the demand for a particular technology. These subcultures of musicians/composers, growing in number over time, would have offered a much more suitable structure to the narrative.

A second critical remark is that Warner doesn't distinguish between use and appropriation, as has become common in the history of technology. Admittedly, he may have a point in this case, since musicians are always appropriating their instruments, but he doesn't make this explicit. In the chapter about the microphone, Warner relates some beautiful parallels to the computer stories in the development of this technology. The microphone wasn't just used to record or amplify as it was designed for, but was by some people, Warner shows, discovered to make new sounds audible to the audience, and therefore offered new opportunites to the composer. Musicians made unexpected use of one of the drawbacks of the new equipment: the feedback whooping when the microphone would pick up it's own amplified sound. Certainly on some