victory in the Civil War. As the author points out, however, Lomonosov's importance was more than simply to the development of the Russian railway system; he also played a part in demonstrating the feasibility of the use of diesel engines to power mainline railway locomotives.

The author does not gloss over the many stops and starts in Lomonosov's career in a variety of countries, his personal and intimate relationships with the various women in his life, or his misinterpretation of the consequences of the changing Soviet attitude in using the old pre-1917 class of technical specialists, and so on. Balancing well chronological and thematic examination of the subject's life, the book comes complete with both a very impressive 'select' bibliography (running to over seventy-five pages) and a detailed index. Given the comprehensiveness of the work, its well-organized structure and the quality of the writing, this book can comfortably be adjudged not only to be the definitive work on its subject currently available, but also likely to remain so for many years to come.

Steven J. Main
Defence Academy of the United Kingdom

Robert H. Sanders, **The Dark Matter Problem: A Historical Perspective**. Cambridge: Cambridge University Press, 2010. Pp. viii + 205. ISBN 978-0-521-11301. £35.00 (hardback).
doi:10.1017/S0007087412000623

Robert H. Sanders's *The Dark Matter Problem: A Historical Perspective* is an attempt to present how the theory of dark matter has developed over the past seventy-five years, and to explain why it is now such an essential component of astronomy, astrophysics and cosmology. The book, although explicitly aimed at cosmologists, astronomers and particle physicists, would function better as a resource for undergraduate physics students. Mathematics is kept to a minimum so that non-specialists can appreciate the book. However, the book is unlikely to be of use to readers with some grounding in the history, sociology or philosophy of science.

Sanders essentially offers a traditional historical narrative of the concept of dark matter and its emergence as a physical entity in the twentieth century until the more recent experimental attempts to detect it. However, one thing that this work is lacking (despite its title) is an insightful historical perspective into the dark matter problem. Readers of *BJHS* may find the work interesting if they have limited knowledge of dark matter in modern physics. However, if they possess a basic understanding of the dark matter problem, the book will fail to impress.

This is not to say that the book has no value at all. For one, the appendix is thorough, yet concise, and allows readers with some understanding of physics to work through the content. Sanders's understanding of the physics and astronomy throughout is also impressive. His presentation of the history of dark matter experiments and research projects is commendable. This is where the book's strength lies.

The historical narrative covers many of the important developments in the history of dark matter. Sanders succinctly identifies the early work by Zwicky and the instantiation of the modern concept of dark matter. He clearly describes the discrepancies in the rotation curves of galaxies, discusses some early possible solutions to the problem, looks at the emergence of the dark halo hypothesis, discusses the important introduction of radio astronomy and its relevance to dark matter, and comprehensively covers the interpretation of astronomical data.

Cosmology and the birth of astroparticle physics is, again, a good introduction into the topic. However, a historical discussion into the value of the density parameter of the universe, Ω, is strangely absent. Rather, the value $\Omega = 1$ is presented without acknowledgement of the controversy surrounding the issue. This parameter, derived from the standard Big Bang model, has enormous implications for the amount of dark matter (both baryonic and non-baryonic) and dark energy in the universe. Sanders explains that the most recent experiments

have indicated that the universe appears to be flat, but a critical historical perspective on this facet of standard modern cosmology and its relevance to dark matter is missing from the work.

An overarching criticism is that dark matter is not thoroughly problematized. When problematic aspects of dark matter are presented, the presentation is somewhat trivial and relies purely on argument from other areas of physics or the historical narrative. Sanders explains that he has forty years' experience working as a physicist, often directly involved in dark matter research. He states in the introduction, 'This description is personal and based largely upon my perspective as an interpretive astronomer' (p. 1). It is perhaps for this reason that Sanders is not able to probe the dark matter problem in a more nuanced or sophisticated manner.

Sanders's chapter on modified Newtonian dynamics (commonly known as MOND) is a thorough explanation of this front-runner in alternatives to the dark matter hypothesis. Sanders's personal interest in MOND seems to bring this chapter to life; a chapter which concisely outlines and critically discusses MOND in a moderate manner, rather than championing one side of the potentially antagonistic Dark Matter-versus-MOND debate.

The book's blurb and press release state, 'The author comments on the sociology of these events'. The term 'comments' is, it seems, the most appropriate term, for Sanders does not analyse, critically discuss or evaluate the sociological perspective on the dark matter problem. His comments are fleeting and not fully developed. When he does provide an insight of some significance – such as the claim that the dark matter community 'first refused to accept the obvious evidence for a significant anomaly in galaxies and then, in total reversal, saw dark matter everywhere' (p. 68) – the reader is left wanting more.

Brief references to some of the pioneers of the philosophy of science (namely Popper and Kuhn), although relevant, demonstrate a lack of philosophical insight beyond a very simplistic conception. Another criticism to note here is the lack of references to more detailed or complex literature that would allow the inquisitive reader to investigate these topics any further. This brief chapter – 'Reflections: a personal point of view' – has the potential to trivialize a vast amount of research into the philosophy and sociology of science.

This book functions as a good tool for readers with some basic knowledge of physics and no knowledge of dark matter to broach the topic. Unfortunately, readers with some grounding in dark matter will not find the historical perspective particularly insightful. Perhaps a better title for the book would have been 'An introduction to dark matter', as it is a concise and comprehensive introduction to the subject. This work purports to fill a gap in the literature by covering an important and underresearched area of historical, social and philosophical investigations into the dark matter problem. Regrettably, Sanders's treatment of the dark matter problem does not live up to expectations.

Jacob V. Pearce
University of Melbourne

Louis Niebur, **Special Sound: The Creation and Legacy of the BBC Radiophonic Workshop**. New York and London: Oxford University Press, 2010. Pp. 259. ISBN 978-0-19-536841-3. £17.99 (paperback); 978-0-19-536840-6. £60.00 (hardback).
doi:10.1017/S0007087412000635

How did electronic music become an unremarkable, commonplace, part of our sound world? For any 1950s proponent of the experiments of Karlheinz Stockhausen or Pierre Schaeffer, this turn of events would seem remarkable, as their heroes grappled with the new tape recorders and laboratory equipment to produce, with great effort, kinds of music that, far from being everyday, often sounded spooky and other-worldly. Louis Niebur's excellent new book can provide part of the answer, at least for the British context, because it shows how electronic sounds became