

Advancement of Science (BAAS) – not its leadership, or its annual pageant, but its cold, hard cash. British tidal research would have foundered several times over without injections from the research committee of that institution. Victorian success in observational networks of all sorts clearly stemmed from the example of the BAAS commitment to such projects, and is under-appreciated presumably because subsequent generations worked so hard to create the rationale for public funding of science. Reidy lays claim through such stories to the theme of Victorian scientific collaboration, and his conclusions on collaboration as ideal and as practice are valuable to a wide range of other sciences and other eras.

Reidy also concludes that the story of tidal research testifies to the globalizing vision of Victorian science, citing Whewell's isographic techniques, the 1830s networks for synchronic observation, and a keen sense of natural knowledge as the framework for global commerce and empire. This is familiar historiographical terrain, though no less interesting in its details for that. And yet the overwhelming impression left by this story is of the weight and significance of local conditions and local expertise, and the limited penetration of these by the elite methods and practitioners of natural philosophy. The tidology of the 1830s may have held consequences for future initiatives in government-sponsored science, but it is not really clear that it came to dominate the other world of practical navigational expertise that Reidy lays out so well. Nor was I fully convinced that the enterprise of tidal research led to a decisive reimagining of the ocean as a controlled natural space. Whewell's maps and tables seem powerful in some settings, but papery-thin in others. An 'end-user' picture of the authority of the new knowledge of the nineteenth century related to the ocean – who used the new knowledge about magnetism, meteorology, tides and surveying, how and when, at home or abroad – is needed to make this clear. The strengths of this book instead lie with the rich picture of the organization and production of knowledge and the bridges between different interests in a science of the oceans.

KATHARINE ANDERSON  
*York University*

WILLIAM H. BROCK, **William Crookes (1832–1919) and the Commercialization of Science**. Alderhot: Ashgate, 2008. Pp. xxi + 556. ISBN 978-0-7546-6322-5. £65.00 (hardback). doi:10.1017/S000708740999032X

William Crookes's professional career stretched from the mid-nineteenth century into the early twentieth – significant decades for the emergence of modern chemistry. Crookes witnessed and participated in far-reaching changes in the theories and concepts of his discipline as well as in the status, careers and professional biographies of chemists within Victorian society. Yet, though one of the most prominent, recognized and decorated scientists of his time, he has been historically marginalized and neglected, much like his contemporary John Tyndall.

William Brock's weighty volume seeks to situate Crookes within the context of nineteenth-century scientific careers and to rehabilitate a scientific reputation that has been tarnished by its association with spiritualism and speculative theories of matter. As a biography, it is comprehensive and heavily descriptive. Brock integrates extensive documentary material, occasionally venturing conjectures when evidence is lacking. In reconstructing Crookes's life, it is his impressive array of professional activities, not his private and personal life, that forms the focus of this volume.

Brock concentrates much of his study on Crookes's involvement in photography, spectroscopy, chemical analysis, fertilizers and such public-health initiatives as the use of disinfectants, water purification and sewage treatment. Through these and other remunerated activities as a science journalist and editor, in business endeavours and consultancies for private enterprise and the government, Crookes pointed the way towards a new kind of skilled occupation and career: that of the professional chemist and chemical analyst. Surprisingly, considering his previous work on

Justus Liebig, another enterprising nineteenth-century chemist, Brock emphasizes that Crookes was 'virtually unique among Victorian scientists in combining a business career with scientific research' (p. xiii). Such an amalgamation of research and application interests, which combined social prestige with financial rewards, became increasingly common as the century progressed. Nonetheless, Crookes may indeed be viewed as an early example in Britain of the type of 'scientist-entrepreneur' that Liebig represented in Germany. Perhaps more unusually, Crookes became a respected research scientist despite not having a position in an academic institution or university that would lend him prestige, credibility and laboratory facilities. Instead he earned a very lucrative living through paid scientific activities.

Although the book's early chapters emphasize how Crookes's need to turn chemical knowledge and skills into money drove his particular combination of intellectual interest and opportunism, Brock unfortunately does not consistently pursue this aspect of Crookes's biography. Instead, in aiming for a detailed biographical reconstruction, he follows too many threads too short a distance. Thus, when Brock returns to the theme of marketable applications later in the volume, he describes Crookes's work in the electricity business and public health and sanitation, but makes little attempt beyond the chapter titles to integrate these activities into the early theme of 'commercialization of science'.

A second, inevitable thread of Crookes's life is his interest in spiritualism and psychic phenomena, and several chapters are devoted to his investigation of mediums and his search for scientific proof of their abilities. Much of this history is fairly familiar, and these chapters contribute little to an understanding of Crookes's will to believe in the existence of forces beyond the known. Instead, Brock invests considerable energy in trying to explain how Crookes could have allowed himself to be manipulated and deceived by dubious mediums and fraudsters – a position that carries little historical insight.

With money-making applications and spiritualism forming two themes of this biography, Brock attempts to link the third – Crookes's assumptions on the nature of chemical elements and his theory of atoms – to his spiritualism. Although given to speculative theorizing, Crookes was also a technically adept experimentalist and chemical analyst, as Brock aptly illustrates in his treatment of Crookes's early discovery of thallium; his development of the radiometer; his research into rare earths; his skill at chemical analysis and spectroscopy; his misrecognition of, and later research into, radioactivity; and his theory of the evolutionary development of the elements. The connections between Crookes's practical work, his theories of matter and his interest in psychic forces have, however, been more rigorously discussed by Falk Müller in the case of cathode ray research and the radiometer, and Brock misses an opportunity here to expand upon these connections.

In the end, Brock's study of Crookes is both important and disappointing. On the one hand, in trying to press Crookes in his entirety between the covers of a single book, this volume is overly ambitious. Its overwhelming detail is informative but occasionally tedious. More careful selection would have allowed for a more detailed discussion of significant activities. It is a straightforward, reconstructive biographical history that shows an awareness of current approaches in the history of science, but makes no concerted attempt to apply them analytically to its subject matter. On the other hand, by describing Crookes's business and money-making ventures, his spiritualist activities and his scientific research, Brock has put together a comprehensive and enormously informative volume that will, for all its shortcomings, without doubt become the standard reference biography of William Crookes. It will provide a starting point for the study of this fascinating figure of Victorian science and for more in-depth research into Crookes's significance as a chemist, scientific entrepreneur and Victorian scientific professional.

ELIZABETH R. NESWALD  
*Brock University*