was barely listened to, although in 1897 a paper she had written on fungi was read at the Linnaean Society by one of the Kew staff. Lear devotes several key chapters to these earlier moments in Potter's life, rightly seeing them as essential to a life in nature.

The second part of Potter's life encompasses the years that Lane probed in the earlier biography—those of writing and illustrating the little books and of the mutual devotion of Potter and Norman Warne, one of her publishers. Warne's tragic death shortly before a hoped-for wedding and Potter's valiant struggle to live on and write are of course the meat of biography. Lear does them justice, though in doing so she moves closer to the world of the woman and artist and away from the life in nature.

After this, Potter entered what amounts to a long third portion of her life, when, with her husband William Heelis, a lawyer she married in her forties, she bought properties in the Lake District, raised Herdwick sheep and other livestock, and became a benefactor of the National Trust. Here again Lear's book uncovers interesting facts about Potter's life in nature—this time as an agriculturist—but it also must rely on Potter's letters rather than her journal and seems excessively expansive, losing some of its color.

Of these last years we learn that Potter continued her interest in fungi when she found out about the developments in research into penicillin—work that confirmed some of her own earlier findings—and that she was fascinated by the sounds made by toads and newts, having read about them in the newspaper. She also still occasionally drew. But the later life in nature became a grueling struggle. Keeping stock alive and farms working was time consuming, and Potter's insights into the biological world were either about farm animals or were stimulated by reading the news rather than by an urge to see and discover. Always a bit prickly, like her beloved hedgehogs, in this last period Potter—previously seen as a realist—becomes both a philanthropist and a bit of a misanthrope, an interesting contradiction that Lear fails to probe as she becomes preoccupied with the facts and day-to-day round of Potter's life and her importance to preservation and conservation.

Readers interested in natural history and science in Potter's day may be disappointed in the lack of scientific context in *Beatrix Potter;* those steeped in British culture may miss the unique ambience of the Victorian and Edwardian worlds; and aficionados of the sister arts in Potter's day may wish to take exception to sentences like "Beatrix Potter brought nature back into the English imagination with her books and illustrations" (p. 447). But anyone desiring a comprehensive study of the facts of Beatrix Potter's life, chronologically told, carefully researched, and well written, will find Linda Lear's biography a very satisfying read.

BARBARA T. GATES

**Esther Leslie.** *Synthetic Worlds: Nature, Art, and the Chemical Industry.* 280 pp., illus., bibl., index. Harmondsworth: Reaktion Books, 2005.

*Synthetic Worlds* revisits several aspects of our knowledge of the fascinating story of the emergence of artificial substances from the mid-nineteenth to the mid-twentieth century; in doing so, it serves as an excellent example of how we might further explore a major technological change in history. The book opens new avenues of research. It examines synthetic products in a very different way than the approaches standard within the community of historians of science and technology. Indeed, Esther Leslie does not follow the "traditional" bibliography of the history of the emergence of synthetic dyes in the second half of the nineteenth century. She does refer, for instance, to Franco Brunello's *The Art of Dyeing in the History of Mankind* (Neri Pozza, 1973), but she makes no use of more recent contributions, such as Anthony Travis's *The Rainbow Makers* (Lehigh, 1993).

Reading a new book on synthetic dyestuffs, one expects once again to come across details of the life and work of such pioneering figures as August Wilhelm Hoffmann and William Henry Perkin, but, surprisingly, that is not the case here. Instead of focusing on the science-based industry of the second half of the nineteenth century, a pattern of success well represented by the German chemical industry, Leslie roots the emergence of synthetic dyestuffs in the German Romantic tradition of the early nineteenth century. This is one of the reasons why preeminence is given to Johann Wolfgang von Goethe's friend Friedlieb Ferdinand Runge (1794–1867). In fact, Runge was a key actor in the pre-1856 period of the history of synthetic dyestuffs—the period before Perkin's famous discovery of mauveine. There is plenty of historical evidence that Runge should be given a prominent place in a revised standard account of the history of synthetic dyestuffs, and this is one of the book's most valuable contributions.

Runge's *Bildungstrieb* (the artistic diffusion of synthetic colors through a paper surface, which is often presented as the origin of chro-

matography) is a good example of the intersection of science, technology, and art. It adds a new example to the already known "artistic" practices of several prestigious calico printers and colorists from earlier in the century and reinforces Goethe's *Zur Farbenlehre* (1810) as a model of the integration of scientific, artistic, and technological factors in a unified account of the theory of colors. As John Gage has also shown in his *Colour and Culture* (Thames & Hudson, 1993), the new palette of synthetic colors provided new artistic possibilities to painters and artists.

Nevertheless, Runge's profile as an artist-chemist seems to be more an exception than a rule among the main actors in the long-term technological change from natural to artificial dyestuffs that took place throughout the nineteenth century. The history of the chemistry of synthetic dyestuffs probably owes more to Justus von Liebig's tradition and to the German style of organizing a science-based industry complex in the final decades of the nineteenth century than to the Romantic approach followed by Goethe and Runge.

Nonetheless, *Synthetic Worlds* offers a very interesting reflection on the concept of "artificiality." It explores the power of the chemical industry to transform nature—to make new compounds and to imitate natural substances in the lab and on a large scale. In that sense, the new colors became commodities, industrial objects that Leslie submits to critical analyses as elements of the industrial capitalism of the nineteenth century and even as features with uses in the Nazi period, as the chapter on I.G. Farben clearly shows. In Leslie's view, the new families of aniline colors—synthetic alizarin and indigo—are more than simple chemical reactions that were tested in quality control laboratories and also more than substances produced on a large scale in factories. They tell us a great deal about artistic taste, business, nature, politics, and the environment. "The Poetics of Carbon," "Class Struggle in Color," and "Nazi Rainbows" are some of the intriguing chapter titles, signaling Leslie's broad cultural approach to synthetic colors. As stated on page 11, the book "tracks the confluence of technologies of industrial production, philosophies of science, politics and aesthetics from the onset of industrial capitalism." This is what makes *Synthetic Worlds* particularly fascinating—though at the same time it points to the book's lack of a defined analytical focus.

Inspired by the work of Theodor Adorno and Walter Benjamin, Leslie takes a critical approach to the development of the chemical industry and its capacity to transform nature in depth. She also uses Marx, Engels, and Lenin as contemporary witnesses of the technological change from natural to artificial colors. The book helps us to integrate science and technology better in the works of some of the most relevant Marxist thinkers, a topic that surely warrants further exploration.

This is a daring and original book that will raise many interesting questions for historians of science and technology. Despite its heterodoxy, as a whole it challenges an overly optimistic image of science, technology, and progress that is still a subtle component of our research agendas.

AGUSTÍ NIETO-GALAN

**David Philip Miller.** *Discovering Water: James Watt, Henry Cavendish, and the Nineteenth-Century "Water Controversy."* (Science, Technology, and Culture, 1700–1945.) 330 pp., illus., bibl., index. Burlington, Vt.: Ashgate, 2004. $ 114.95 (cloth).

The 1839 meeting of the British Association for the Advancement of Science was the starting point of a priority dispute about a scientific "discovery" involving many eminent British philosophers and scientists. At the time, the "discovery" at stake was already part of the history of science. It concerned a major shift in the Chemical Revolution: a series of combustion experiments with hydrogen, performed between 1781 and 1784, and the subsequent theoretical conclusion that water was not an element but a chemical compound consisting of hydrogen and oxygen.

In the vein of Robert Merton, David Philip Miller uses this controversy as a vehicle to study more general epistemological and sociological questions about the nature of science and of the scientific community. But Miller seeks thoroughly to historicize Merton. He studies controversies not to carve out a universal normative structure of science but to trace the contingent ways in which the historical actors "attributed" the label "discovery" or "discoverer" to certain events or persons. What counted as a scientific discovery in early Victorian science and culture? What was the image of science and of its relation to industry and society in that time and culture? What kinds of broader social interests informed the BAAS members' images of science and scientific discovery? These are the major questions that Miller discusses effectively at the beginning of his study. A controversy is thus used, in a