

differential geometry and string theory, the subject of *The Shape of Inner Space* (Basic, 2010), another collaborative effort with Steve Nadis, a science writer and former MIT Knight Science Journalism Fellow.

In the final analysis, Yau and Nadis succeed admirably in making clear how Harvard has long served as a magnet, attracting some of the world's best mathematicians and thus making it an exciting place to be, a melting pot of mathematical activity.

Joseph W. Dauben

Gabriel Finkelstein. *Emil du Bois-Reymond: Neuroscience, Self, and Society in Nineteenth-Century Germany.* (Transformations: Studies in the History of Science and Technology.) 362 pp., illus., bibl., index. Cambridge, Mass./London: MIT Press, 2013. \$38 (cloth).

This scientific biography singles out Emil du Bois-Reymond's contribution to experimental physiology—a subdiscipline that is generally credited with ushering in the exact scientific method in nineteenth-century Germany. But usually it is Hermann Helmholtz who is named first, while du Bois-Reymond, Ernst Brücke, and Carl Ludwig appear as lesser figures. Gabriel Finkelstein now delineates du Bois-Reymond's decisive contributions: his unremitting experimental research in electrophysiology, on the one hand, and his role as a herald of modern science, on the other. The Berlin professor campaigned for scientific modernism in experimental lectures and public speeches, which in one instance even stirred debate in parliament (p. 254 f). Finkelstein's masterly prose aims at an interplay of "neuroscience, self, and society," as the subtitle of this substantial monograph reveals. Biography may be regarded as a programmatic choice for the monograph, since this literary form easily lends itself to a contextualization of scientific method as a "politics of the mind" (p. 59). Du Bois-Reymond's riposte against vitalism and his stern advocacy of mechanical physiology are traced by Finkelstein as a practical self-definition of the Bildungsbürgertum—as a "mechanical model of identity" (p. 58).

Emil du Bois-Reymond is based on rich source materials from several German archives and quotes extensively from letters, obscure newspaper articles, and publicly held obituaries. A significant segment of German academic life can be resurrected from these sources. Finkelstein pulls out telling facts—for example, he describes how in the early travel diaries du Bois-Reymond's writing is gently corrected by his mother's hand. He presents vivid images of a Huguenot upbringing rather than research on the topic. The book is admirably organized and printed in a first-rate layout. In its soberness it seems to mirror du Bois-Reymond's own utmost care for the highest quality in publication and illustration. In fact, some historical etchings blend in perfectly with the present book. They are printed alongside rare photographs of late family life. The few portraits that are included serve as part of an argument.

The chronological order of biography is not abandoned, but it is made flexible and capable of comprising four focal points of a more systematic nature. The first of these, "Beginnings," not only offers a nuanced story of early and higher education but can be read as a concise portrait of the academic cultures at Bonn and Berlin. The second part is dedicated to "Experiments." It depicts du Bois-Reymond's scientific achievements in combating the "spectre" of "Lebenskraft" (p. 64). His laboratory experiments are followed through phases of success and periods of failure. Finkelstein adds an almost dramatized account of du Bois-Reymond's only chance to win the approval of the French Academy of Sciences. His presentations, which included the muscles of his own arms, did not entirely convince the commission. The third part of the book is entitled "Life." It deals with marriage. Those who are inclined to dismiss mediocre love letters and accounts of decorative wallpaper will probably flip through this chapter. They will miss a close-up look at the domestic division of labor, evidence pertaining to economic status, and precious examples of female arrogance. The last chapter, "Fame," concentrates on du

Bois-Reymond's manipulation of public opinion. In this arena he used all his influence to promote Darwinism and to delineate the limits of knowledge ("Ignorabimus!").

Due to this public activity, Finkelstein justly presents du Bois-Reymond as the nineteenth century's "most important forgotten intellectual" (p. xv), and he excels in linking scientific endeavors with cultural and political contexts. But what the biographical account adds in narrative lucidity comes at a price: research is not merely relegated to footnotes but is hidden in endnotes. No one who reads that du Bois-Reymond used blotting paper that was partly covered with "a protective layer of pig bladder soaked in egg white" (p. 67) will ever again divorce this kind of research from its instruments. But the role of laboratory equipment theorized by the Berlin research group "Experimentalization of Life" does not figure very prominently in the book. Similarly, the rich results on the history of objectivity seem to be circumvented when Finkelstein states that the term "objective" is supposed to mean "relating to an object" (p. 95). Thus the author stops short of reflecting the inner conceptions of scientific method, while depicting its advent and functions in the external setting of industrialized society. Sven Dierig's thesis that Neohumanism and not Romanticism gave distinction to du Bois-Reymond's laboratory work does not leave a trace. Everett Mendelsohn is mentioned in the endnotes, but the biography does not seem to be responsive to his analysis of du Bois-Reymond's exceptionally bellicose language, which is explained as a leftover from the 1848 students' revolutionary demeanor. Finkelstein wants to highlight the positive, progressive views of his protagonist, who is often perceived as a negative figure. But the extent to which his modernity was sustained by forces of negation—a stunning virtuosity in conjuring up foes, instigating hostility, and engaging in vigorous boundary work—remains invisible.

The book builds on several articles and a thorough biography that Finkelstein himself authored in 1996. But this latter was confined to the first half of du Bois-Reymond's life. The author considerably surpasses his previous work not only in the scope of his treatment but also in the quality of his conclusive summaries: for example, "By coupling instruments to nerves he uncoupled knowledge from affect" (p. 96); or "Embryology still adhered to the Romantic concept of forms in time, whereas physiology preferred the more modern perspective of functions in space" (p. 59).

All kinds of potential readers will benefit from the rich source material and elaborate narration. The fact that Finkelstein avoids explicit methodological reflections does not in any way indicate the absence of original and even daring perspectives, although these are rendered in an implicit way. The result is a very vivid study on the end of biological vitalism.

Anna Echterhölter

Peter Reed. *Acid Rain and the Rise of the Environmental Chemist in Nineteenth-Century Britain: The Life and Work of Robert Angus Smith.* (Science, Technology, and Culture, 1700–1945.) xv + 209 pp., illus., bibls., index. Farnham, Surrey: Ashgate, 2014. £70 (cloth).

The scientific work and legacy of Robert Angus Smith have long been unfamiliar to historians of the nineteenth century. Peter Reed's book makes a strong case that this shouldn't be so: Smith's career and the development of environmental chemistry deserve a great deal of attention, especially among those interested in the environmental, economic, and legal aspects of mass industrialization. The book explores the national and civic contexts of Smith's work and adds significant new information to the existing histories of chemistry, public health, and meteorology. It presents a comprehensive account of a chemist who made a major contribution to atmospheric chemistry, air pollution studies, industrial consultancy, and sanitary science.

Acid Rain and the Rise of the Environmental Chemist in Nineteenth-Century Britain opens with a synopsis of Smith's career, placing it within the broader framework of mid-Victorian civic science.