Book Reviews

Reformers in Physiology

Two Great Scientists of the Nineteenth Century. Correspondence of Emil Du Bois-Reymond and Carl Ludwig. Collected by Estelle Du Bois-Reymond; foreword, notes, and indexes by Paul Diepgen. Translated from the German edition (Leipzig, 1927) by Sabine Lichtner-Ayèd. Paul F. Cranefield, Ed. Johns Hopkins University Press, Baltimore, 1982. xx, 184 pp., illus. $15.

Carl Ludwig invented the kymograph, published fundamental studies on cardiovascular and other functions, and trained a generation of physiologists. Emil Du Bois-Reymond opened the way to the study of the role of electricity in nervous and muscular phenomena. Both were members of the "1847 group": with Hermann Helmholtz and Ernst Brücke they set out at mid-century to create an organic physics, a militant new physiology based on quantitative and experimental analysis and scornful of the vagaries of vital force ideas. Both cut imposing figures in the historiography of 19th-century science. Their correspondence reveals what is less well known: a close, warm, and long-sustained friendship that comprised shared views on science and scientists and similar career struggles. Originally published in German with thorough annotations by Paul Diepgen, these letters are now made accessible to English readers in a fine translation. Spanning nearly half a century, from 1847 to 1894, the exchange is densest and liveliest in its early years.

The letters give life and specificity to the physicalist program of the 1847 group. In part this was a posture, a set of attitudes firmly held and often pointedly expressed. In the relentless bright light of the ideal rigor and exactitude both men pursued, no field but physics escaped censure. Ludwig wrote that he decided to study science only "after working my way through all the medical men's old rubbish for six years as a student, realizing at long last that it was unfounded." Du Bois-Reymond snapped that "all chemistry has so far been nothing but shopkeeper's bookkeeping." Anticipating incomprehension of his own work, Du Bois-Reymond asked gloomily, "But can one hope with this to get through to the physiologists, before whose coarsely woven visual matter the most that the word electricity conjures up is the rococo image of a colossal electrostatic machine on feet of sealing wax?" As for the traditional fields of systematics and morphology, Du Bois-Reymond revealed his distaste when he complained to Ludwig that his great mentor Johannes Müller "has kept me occupied at the museum, carrying out what is in his opinion the highest activity of the human intellect, namely, classifying fossil vermin." More telling are many details that bear witness to the day-to-day struggle to forge a new physiology. Among these are Ludwig's efforts to learn differential and integral calculus, both men's never-ending love-hate relationship with instruments and instrument makers, and descriptions of experiments completed, under way, or planned.

The correspondence, and Diepgen's annotations, have much to offer on the personal lives of Ludwig and Du Bois-Reymond, the financial and professional hardships of their early careers, their relations with students and contemporary scientists, and the vicissitudes of German politics, academic and otherwise. Very useful name and subject indexes, bibliographies, and forewords by both Diepgen and Cranefield enhance the attractiveness of this edition. Specialists and those with general interest in the history of science are in debt to the Johns Hopkins University Press for making it possible.

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German Chemists

The Formation of the German Chemical Community (1720–1795). KARL HUFBAUER. University of California Press, Berkeley, 1982. viii, 312 pp., illus. Cloth, $40; paper, $14.95.

In 1784 Lorenz Crell prefaced an issue of his recently founded journal *Chemische Annalen* with some thoughts on "the inherent, I might almost say inborn, propensity of the Germans for chemistry." Although today we would not invoke the cause Crell alludes to, the fact remains that in the 18th and 19th centuries German chemists were preeminent in ways that were widely acknowledged by scientists in other nations. Yet within Germany itself, which in the 18th century remained a collection of independent states, a national community of chemists was not firmly established until the 1790's. Now, thanks to Karl Hufbauer's extraordinarily detailed research, we know who the chemists were who created this community, where they worked, and how they generated the sense of common interest that in the 19th century provided the basis for the professionalization of German chemistry.

The depth of Hufbauer's research can best be appreciated by turning first to the three appendixes that fill the second half of the book. In the first he provides biographical profiles of the 65 leading German chemists of the 18th century, in the second he gives brief histories of the 59 German learned institutions that employed chemists as professors or academicians during the 18th century, and in the third he identifies the subscribers to Crell's journal. The material contained in these appendixes, as well as other carefully quantified information on topics such as patterns of citation, salary levels, and publication rates, has also been subjected to various forms of analysis, the results of which are presented in 21 tables included in the first half of the book. Anyone interested in any of the subjects Hufbauer addresses in his book can now consult what is virtually a social encyclopedia of 18th-century German chemistry.

Hufbauer's interpretation of his data, though frequently insightful, is less impressive. He is to be commended for his clear descriptions of the historical and cultural conditions in which the German chemists worked and his narrative account of the reception Lavoisier's "French chemistry" received in Germany. But when he reaches further in an attempt to explain the appeal of chemistry in the age of enlightenment and the ways social factors influence science in periods of theoretical upheaval, he is notably less successful.

Hufbauer analyzes German support for the development of chemistry in terms of moral, material, and manpower factors. Regarding the first he declares, "My thesis is that moral support for chemistry emerged in 18th century Germany because educated and powerful Germans embraced new values that made them more receptive to new information being disseminated about that science" (p. 14). Hufbauer here uses the term "moral" to describe all non-material cultural support for chemistry. He is correct, of course, in seeing chemistry's