siders his trajectory in both the Parisian mathematical milieu and the republican political one in 1830–1832. Galois was an aspiring mathematician whose fate with regard to the academy was by no means exceptional compared to others; only after he was imprisoned as a republican did he become bitter and wish for revenge against academic and official science.

Chapters 7–9 deal with the different appropriations of Galois in the course of the nineteenth century, considering their mathematical and institutional contexts and the legitimation strategies of a large number of mathematical actors. Galois's mathematical and heroic legend was founded at the beginning of the twentieth century thanks to two crucial events. First, algebra courses and textbooks, which featured a research tradition that bore Galois's name, began to be taught and published in different places and universities in Europe and the United States. These featured a "hard core" common to all local traditions, and so "Galois theory" was born. Second, a first historical biography of the "normalien" Galois was written on the occasion of the commemoration of the centennial of the Ecole Normale. It gave birth to various hagiographic discourses—reaching far beyond mathematicians—that created an iconic Galois, a republican and mathematical genius whose modernity, misunderstood in his day, inspired his followers.

HÉLÈNE GISPERT

Kostas Gavroglu; Ana Simões. *Neither Physics nor Chemistry: A History of Quantum Chemistry.* (Transformations: History of Science and Technology.) xiv + 351 pp., illus., bibl., index. Cambridge, Mass./London: MIT Press, 2011. $40 (cloth).

Neither Physics nor Chemistry is the latest product of a roughly twenty-year collaboration by two scholars who deserve much of the credit for bringing quantum chemistry to the attention of historians of science. It offers a synthesis of their earliest to most recent researches, long awaited by those familiar with their work. The book consists of four historical chapters spanning roughly from 1927 to 1970 and an epilogue addressing "historiographical considerations." The authors arrange the historical chapters roughly chronologically but organize each chapter around a different "style" of doing quantum chemistry. To each of these styles they ascribe a distinct pattern of development, period of ascendancy, and geographical homeland. Despite some overlap between chapters, there is a pervasive linearity to the narrative, which fosters a sense not only of the discipline advancing technically but also of its practitioners becoming increasingly amalgamated and professionally self-aware; nonetheless, the reader is emphatically reminded of the historical contingency of this progress.

The first chapter treats the earliest uses of quantum mechanics to investigate chemical valence and molecular structure, work carried out largely within the German physics community. The second chapter examines the immediate responses to these physicists' "first principles" approaches and the development of less rigorous but more broadly applicable semiempirical methods, particularly in the United States. This chapter includes a careful account of the emergence of the molecular orbital and valence bond theories, whose rivalry has long shaped scholarship on early quantum chemistry. Although the historical material in these chapters will be familiar to many readers, its integration into a discussion of broader and longer-lasting trends in quantum chemistry provides welcome new insights.

The next two chapters introduce progressively more novel historical material. The third covers the British development of quantum chemistry as a branch of applied mathematics between roughly 1929 and 1952 and expands significantly on earlier articles by the authors. The final historical chapter, covering the effects of the introduction of large-scale computing, focuses primarily on the postwar era and also chronicles the construction of an international quantum chemistry community. This penultimate chapter contains substantial new research. Of particular interest is a novel treatment of the French quantum chemistry community, within which—with minimal fanfare—the authors introduce Alberte Pullman, one of the rare female research group leaders in mid-twentieth-century chemistry.

Kostas Gavroglu and Ana Simões lend their historical episodes conceptual coherence through six "clusters of issues" on which they focus to varying degrees in each of the first four chapters. These are "the epistemic content of quantum chemistry, the social issues involved in disciplinary emergence, the contingent character of its various developments, the dramatic changes brought about by the digital computer, the philosophical issues related to the work of almost all the protagonists, and the importance of styles of reasoning in assessing different approaches to quantum chemistry" (p. 7). The list suggests an innovative, polyvalent vision of disciplines and discipline building, but the authors do not develop this vision

into a concrete schema. They do offer several keen observations regarding "in-between" disciplines, as they dub those fields, like quantum chemistry, that cannot be unambiguously arrayed under just one of the classical nineteenth-century disciplines. But their comparative reticence on the general topic of disciplines appears something of a missed opportunity, both for the further development of our understanding of the organization of scientific research in the "post-disciplinary" era and for providing the reader with a clear sense of the broader insights to be gained from a careful study of the history of quantum chemistry.

The authors' treatment of the thorny topic of theory in chemistry and the oft-allied question of the reduction of chemistry to physics is similarly perspicacious but not pointed. These themes dominate the closing chapter on historiographical considerations, within which the authors rely productively on a comparison between the development of quantum chemistry and chemical thermodynamics to provide new perspectives on the uniqueness of chemical theories and the irreducibility of chemistry. However, the precise bearing of this analysis on *quantum chemistry*, which, although clearly an inspiration for much reflection on these topics, is both more than a theory and less than the sum of all chemical theory, remains somewhat ambiguous. In the end, Gavroglu and Simões forge neither their "clusters of issues" nor their discussion of chemical theory and reductionism into the kind of epigrammatic thesis fashionable for pedagogical and methodological references. Nevertheless, the book clearly offers more than a repository of the most up-to-date historical research. It presents a distinctive and compelling view of quantum chemistry as an "in-between" discipline that is likely to make it a standard reference on the topic for years to come.

JEREMIAH JAMES

Karen Jelved; Andrew D. Jackson (Editors and Translators). *The Travel Letters of H. C. Ørsted.* (Scientia Danica: Series H, Humanistica, 8, Volume 3.) xxix + 536 pp., illus., index. Copenhagen: Det Kongelige Danske Videnskabernes Selskab, 2011. $80 (paper).

The Danish natural philosopher H. C. Ørsted (1777–1851) has earned a prominent place in the history of science owing primarily to his seminal experimental discovery of the interaction of electricity and magnetism in 1820. He was, moreover, an avid traveler and a man of letters whose interests ranged widely over literature, philosophy, the arts, and politics. This combination makes his travel letters a rich and fascinating source for historical studies of the sciences in the era in Europe later called romantic.

The present volume is divided into eight chapters covering chronologically the many travels Ørsted undertook throughout his career. In the early nineteenth century Denmark was positioned in the cultural and scientific periphery, and it was customary for future scientists to undertake a journey abroad to visit the centers of their respective fields in order to enhance their qualifications and establish scientific liaisons. As a graduate in pharmacy with a doctoral degree in philosophy, and with a galvanic element of his own invention in his pocket, Ørsted set out on his first journey, undertaken in 1801–1803, to Germany, France, Belgium, and the Netherlands to study the science on the research front at the time—namely, chemistry. Perhaps this journey is the most interesting when seen from the perspective of the young man's curious and idealistic interest in new attractive thoughts, particularly German *Naturphilosophie* and how it could serve as inspiration in scientific inquiry. This interest immediately paved the way for his close friendship with the eccentric natural philosopher Johann Wilhelm Ritter and the romantic scholars in Jena and Weimar. Among the scientists in Paris, on the other hand, Ørsted's enthusiasm for the speculative ideas in German *Naturphilosophie* was met with much skepticism. Ørsted's second journey, in 1812–1813, took him again to Germany and France. By this time he had become a professor at the University of Copenhagen. During this journey he completed and published his book *Ansicht der chemischen Naturgesetze* and a slightly altered French edition of this work in an attempt to address the two very different scientific cultures. Ørsted's third foreign trip, in 1822–1823, took place after his discovery of electromagnetism, and this journey progressed as a triumphal procession through Germany, France, and England. The later journeys were often motivated by Ørsted's participation in the annual meetings of German, British, and Scandinavian scientific organizations.

We do not find much information about the sciences *per se* in the travel letters, written originally in Danish to family and friends. However, the letters bristle with reports of the many scientists, philosophers, and other scholars he met, as well as the academies, universities, and other scientific institutions he diligently visited. The travel letters therefore constitute a unique his-