have made him a hero in the present Washington administration.

While Crosland's biography is more the map of a career than a portrait of a man, one senses no great loss here. Gay-Lussac, it seems, was not a striking or interesting personality. However, his life is revealing for what it teaches us about how scientists became accepted and important figures in the modern industrial world. This is a story Crosland has told well, drawing on his extensive knowledge of French science in this period. It is recommended to those who have followed Gay-Lussac into the career of science and who would like to understand something of the historical forces that have shaped their own lives and values.

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The Physics of the Interstellar Medium

J. E. Dyson, D. A. Williams
206 pp. Halsted (Wiley, New York), 1980

The interstellar medium contains a diverse array of physical environments varying from a hot highly ionized component at a temperature of 300 000 K and a density of 0.003 cm^{-3} to cold molecular clouds at 10 K at densities exceeding 10^4 cm^{-3}. Where the massive stars end their lives the interstellar medium is in a chaotic and violent state. There supernova explosions enrich the interstellar gas with the heavy elements produced by nuclear burning in the star, generate energetic cosmic rays and drive shock waves into the medium. These processes create the conditions in which gravitational collapse and cloud fragmentation may occur and a new generation of stars may arise. The formation of stars is accompanied by mass loss in the form of stellar winds and by expanding ionization zones that interact dynamically with the surrounding gas and dissipate the remnant material out of which the stars are made.

Much of the activity in hidden from visual observation because of absorption by solid dust particles; accordingly, the entire electromagnetic spectrum from the long wavelength radio region to the hard x-ray region is used to explore the extraordinary variety of interstellar phenomena.

The interpretation of the observations and the development of a unified description of the interstellar medium demands an understanding of a broad range of physical and dynamical processes. The interstellar medium in turn provides a stimulating arena in which to learn about the physics and chemistry of complex situations of a kind that cannot be simplified by limiting the number of variables but can only be understood by enlarging the observational base.

This book, by John E. Dyson and David A. Williams, uses the interstellar medium as a vehicle for discussing an extensive body of physical and dynamical processes, at an introductory level that should make it readily accessible to most undergraduate seniors in the physical sciences. The authors are expert guides to the subject: Williams, particularly in atomic, molecular and grain processes, and Dyson, particularly in fluid mechanics and dynamical processes. Both have made important original contributions. The book, written in a straightforward style, provides explanations that are lucid and concise. Dyson and Williams give a general account of the structure of the interstellar medium and the observational methods used to probe it. They describe the gas-phase and grain-surface processes occurring in the determination of the ionization and thermal balance and in the formation and destruction of molecules, and they present order-of-magnitude estimates of the temperatures, the degree of ionization and the densities of the various phases of the interstellar gas. The subject of gas dynamics is introduced with a discussion of first principles and moves rapidly but intelligibly to a discussion of shock waves and the effects in interstellar space of expanding nebulae, stellar winds and supernova explosions.

In summary, the book is an excellent introduction to the physics of the interstellar medium. It manages in 200 pages to address most of the important questions and to provide an interesting exposition of the unusual combination of physical, chemical and dynamical principles that are involved in interpreting interstellar phenomena.

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Theory and Applications of Electron Spin Resonance

W. Gordy
625 pp. Wiley, New York, 1980. $39.95

Spin Exchange: Principles and Applications in Chemistry and Biology

Yu. Molin, K. Salikhov, K. Zamaraev
242 pp. Springer, Heidelberg, 1980. $39.00

In 1980 there were 2550 entries in *Chemical Abstracts* under the category "electron spin resonance," up from 2100 in 1975 and 1600 in 1970. These entries seem almost equally divided among chemistry, biology and physics and between applications in the solid and the liquid phases (few are in the gas phase). Electron spin resonance spectroscopy is a tool that has been applied in almost every area of science that is concerned with the electronic structure of matter. This feature of the field—an enormous range of applications linked together by a common technology—creates problems for readers and authors alike. For example, Walter Gordy's book dismisses the subject of spin exchange in liquids in two sentences, while Yuri N. Molin, Kev M. Salikhov and Kirill I. Zamaraev devote their entire monograph to the subject. Every author of an esr book must somehow limit the range of subject matter, and few readers will be completely happy with the choices that are made.

Theory and Applications of Electron Spin Resonance contains four chapters on general esr theory and background; the remainder combine applications and theory in several major branches of esr spectroscopy. No space is devoted to apparatus or experimental details. Spin-labeling, transition metals, double resonance and pulse techniques are also omitted.

The theoretical chapters are suitable for an introductory esr course at a first-year graduate student level. The material could also be used to illustrate various principles in a course on quantum chemistry. While these chapters are straightforward and sound, there are omissions. No mention, for example, is made of Alfred G. Redfield's contributions in the chapter on line strengths, line shapes and relaxation phenomena. Nor is there any discussion of Jack H. Freed's work on relaxation in the liquid phase.

Many of the chapters rely to a heavy degree on work done by Gordy, one of the handful of outstanding scientists who recognized the intrinsic importance of esr spectroscopy just after World War II and helped to lay its foundations.

There are numerous important subjects in esr that are elegantly reviewed: for example, matrix isolation of small molecular free radicals and nuclear couplings in oriented free radicals, the discussion of which includes C^{13} and N^{14} couplings and couplings of α and β protons to both C and N. I found that the section on coupling of protons bonded to nitrogen gave a very useful perspective to a problem in my own research. I suspect that professionals in the field will use this book in just such a manner.

In short, what can be found in Gordy's book is fine. If something isn't there, it is an unfortunate and an inevitable consequence of the mismatch between author and reader in this complex field.

Spin Exchange: Principles and Ap-