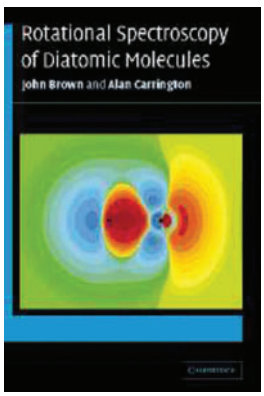
Bessel, Legendre, spherical harmonics, etc.) so commonly encountered in chemistry but yet entirely omitted in these volumes. Some discussion on partial differential equations would have been welcome too.

The argument in the preface concerning the omission of the statistical treatment of error analysis did not gel with me and, irrespective of what practical chemistry courses are provided by a chemistry department, the maths must be the same, and it would have been nice had this been included here. A final topic that should have been mentioned briefly was integral transform methods (for example Laplace and Fourier), not only because they are useful for solving differential equations, but because their understanding is so important for many forms of spectroscopy. It is unrealistic to expect too much to be crammed into two small volumes, but the usefulness of these volumes, especially as a resource, would have been greatly expanded had the authors chosen to include (annotated) bibliographies for further reading and more advanced methods.

*William S. Price is Professor of Nanotechnology at the University of Western Sydney. His research interests involve molecular dynamics in biological and chemical systems using NMR imaging, relaxation, and NMR diffusion measurements.

*Warren Lawrance**



Rotational Spectroscopy of Diatomic Molecules

by John Brown and Alan Carrington
CUP, Cambridge
2003, 1046 pp
ISBN 0-521-53078-4
Softcover, £43

To those in other fields of chemistry it may seem surprising that a book on the spectroscopy of diatomic molecules would fill 1000 pages, and even more surprising that a book focussing only on the rotational spectroscopy of these entities in the gas phase would do so. However, the book's size is a reflection of the authors' intended scope: Brown and Carrington have set out to produce the definitive text on this subject. They have, I believe, successfully met this objective.

Everyone has their prejudices for how such a work should be constructed, and I admit that my prejudice aligns with the approach taken by Brown and Carrington. The first third or so of the book is devoted to the quantum mechanics of the problem. The authors proceed from first principles to develop the Hamiltonian for the system and then relate this to what the spectroscopist measures, which is a set of constants for an effective Hamiltonian. Understanding how the effective Hamiltonian relates to the 'true' Hamiltonian is the key to extracting molecular behaviour from the measured constants. This section is well written and takes the reader through the complex interactions that are revealed by high-resolution rotational spectroscopy.

The second part of the book, which occupies about 60%, deals with various experimental techniques. A brief historical introduction to each technique is presented for each chapter and serves nicely to give the reader a sense of context. Each technique is discussed in detail as is its application to a variety of molecular systems. I liked the fact that the authors do not simply deal in the abstract here, but use liberal examples worked through in detail. In many ways this is the power of this book as a resource: the examples, with references to the original literature, provide the reader with a starting point for an analysis of other, related, systems. The book is comprehensive in its coverage of various techniques, and includes those that might now be considered almost obsolete, although I concur with the authors that their inclusion adds considerable value to the book as a definitive reference.

This is an excellent book and should be a widely used reference for those interested in molecular spectroscopy more generally and not just 'microwave' rotational spectroscopy of diatomic molecules. The interactions discussed can occur in larger molecular systems and in excited states and the discussion in this book serves as an excellent starting point for these cases. The spectroscopy of diatomic molecules is itself no longer a 'hot' topic and it is difficult to imagine getting funded for such work these days, although metal-containing species formed by laser ablation are a possible exception to this generalization. Nevertheless, an understanding of the behaviour of diatomic molecules, revealed by rotational spectroscopy, is an important starting point for understanding larger systems, both covalently and non-covalently bound. In my view the importance of this book will lie in its providing a comprehensive reference for the behaviour of diatomic molecules as a starting point for larger systems.

*Warren Lawrance is Professor of Chemistry at Flinders University, Adelaide. His research interests center on physical chemistry and molecular dynamics.

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