proaches in nmr. This is particularly the case with regard to the spin-temperature hypothesis of Alfred Redfield, and the double-resonance method. By the latter method, Slichter, with Thomas Carver, demonstrated the Overhauser effect for the first time. The chapter on the spin-flip narrowing method pioneered by John Waugh and Peter Mansfield is characteristically a clear exposition. It begins with a discussion of simple artificial averaging arguments. This discussion leads into the rotational operator-Hamiltonian averaging methods, and shows how unwanted dipolar broadening may be eliminated in solids to reveal hidden chemical shift and exchange-coupling interactions in solids.

Unfortunately, this edition contains too many typographical errors. I find this volume very useful as a primary and reference text in courses not only for nmr, but also in introductory quantum optics, which utilizes the same formal techniques of quantum-mechanical analysis.

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Molecular Vibrations in Crystals

J. C. Decius, R. M. Hexter
391 pp. McGraw-Hill, New York, 1977.
$29.50

The classic treatment of the normal-mode analysis of isolated molecules is *Molecular Vibrations: Theory of Infrared and Raman Vibrational Spectra* by E. Bright Wilson Jr, John C. Decius and Paul C. Cross (McGraw-Hill, New York, 1955). A corresponding analysis for molecular crystals has been long overdue. *Molecular Vibrations In Crystals*, by Decius and Robert M. Hexter, is a welcome contribution toward filling this void. It is a self-contained exposition of the spectroscopic properties of molecular crystals in the harmonic approximation. The authors have spent several decades in this field, and their thorough, systematic knowledge shows. As might be expected from a book that shares one author (Decius) with the earlier volume, the F G matrix method is emphasized, in a k-dependent generalization appropriate for crystal studies.

The book begins with a condensed discussion of symmetry, group theory and the normal modes of molecules, followed by equally brief discussions of one- and three-dimensional lattices. Students without previous exposure to these topics will find it necessary to supplement their reading here. Decius and Hexter discuss selection rules, polarization effects and the nature of wave propagation in a di-

electric medium, but they limit the treatment of the important topic of polaritons to four or five pages.

Chapter 6, some 70 pages long, is the heart of the matter, and the authors here give a detailed exposition of internal and external coordinates, and explain how to identify them by the correlation technique. The chapter contains many specific examples chosen to represent a wide number of space groups. In the final chapter Decius and Hexter discuss such symmetry-breaking effects as isotropic solutions and matrix isolation. Twelve appendices gather together much useful information usually located only after searching several books on one's shelf. Among these are character and correlation tables, a list of all 230 space groups and their various notations, generators and sites of symmetry, and a very useful discussion of methods for evaluating lattice sums.

This monograph is a thorough text and reference for the harmonic parametrization of the spectra of molecular crystals. Decius and Hexter do not treat in any detail the underlying interactions responsible for crystal dynamics, nor do they discuss such important anharmonic thermal effects as soft modes and structural phase transitions. The book is, however, recommended as a welcome systematization and "how-to" text for beginning solid-state spectroscopists, especially chemists. As a reference source it will find its way onto most bookshelves to sit beside *Molecular Vibrations* by Wilson, Decius and Cross.

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new books

Atomic, Molecular and Chemical Physics

Backscattering Spectrometry. W.-K. Chu, J. W. Mayer, M.-A. Nicolet. 384 pp. Academic, New York, 1978. $29.50

Photochemistry of Small Molecules. H. Okabe. 431 pp. Wiley-Interscience, New York, 1978. $34.50

Hückel Molecular Orbital Theory. K. Yates. 371 pp. Academic, New York, 1978. $32.00

Atomic Energy-Level and Grotrian Diagrams, Vol. 2 (Sulfur I–Titanium XXII). S. Bashkin, J. O. Stoner Jr. 650 pp. North-Holland, New York, 1978. $80.00

Quantum Chemistry—A Scientific Melting Pot (Proc. of a symp., Univ. of Uppsala, Sweden, August–September 1977) (*Int. Journal of Quantum Chemistry*, Vol. 12, Suppl. 1). P.-O.