

Vibrational and electronic spectroscopy

Symmetry and Spectroscopy: An Introduction to Vibrational and Electronic Spectroscopy. By M. C. Harris and M. D. Bertolucci. Pp. 550. (Oxford University Press: New York, Oxford and London; 1978.) £15.

A NEW textbook dealing with vibrational and electronic spectroscopy, at third-year undergraduate level, with group theory as the unifying thread, has been needed for some time. This ambitious book goes somewhat further into spectroscopy than I would expect third-year undergraduates to go, from foundations which are not quite deep enough.

The book is ambitious because it aims to be self-contained, assuming little background knowledge (except some quantum mechanics). This has meant difficult decisions as to which theoretical results to explain, which to assume and which to ignore. The first chapter is an extremely readable account of groups and representations which deliberately ignores the theorems

of representation theory (the four rules) and simply states the key result, the formula for decomposing a representation, by *fiat*. The relationship between group theory and the Hamiltonian is not discussed: the student who wishes to know why molecular eigenstates necessarily have symmetry properties must look elsewhere, or simply accept that normal coordinates and molecular orbitals transform as irreducible representations. Without making the book longer, much of this theory could have been included at the expense of chapter two, a sketch of quantum mechanics which adds little to the book and incidentally contains an incorrect interpretation of the superposition principle.

The theory of molecular vibrations and of molecular orbitals provided here is rather elementary compared with the level of the spectroscopy which follows. A verbal definition of a normal coordinate without the equations of motion does not indicate clearly what a normal coordinate is, nor why it can sometimes be determined by symmetry. Similarly, without some idea of an effective one-electron potential, one cannot properly explain the Koopmans theorem nor insist that the molecular orbitals have symmetry properties.

Hückel theory is presented here without any suggestion that the Hamiltonian is not the total molecular Hamiltonian.

Most of the above criticism assumes the educational importance of principles in themselves. Of equal if not more importance for the specialist is the application of principles in puzzle-solving; and it is here that the authors have succeeded brilliantly. Interwoven with the text are many examples of spectra (very well illustrated) from the literature and over 200 problems. The student who completes even a modest fraction of these problems should be able to construct symmetry coordinates and orbitals, determine the states which arise from electronic configurations, and decide which transitions are allowed. In short, he should be able to read the literature of vibronic spectroscopy. The theoretical aspects of this book could easily be supplemented by a lecture course. The strengths of the book lie precisely where formal lectures are often weak—in examples—and for this reason both teachers and students will find it valuable.

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Fundamental research in gerontology

The Biology of Ageing. Edited by J. A. Behnke, C. E. Finch and G. B. Moment. Pp. 388. (Plenum: New York and London, 1978.) £11.93.

AGEING is the next growth industry, perhaps hardly surprising in Western Societies, as two of the three major scourges—famine and pestilence—have been controlled, and the third—war—is unacceptable, at least in theory. About 1 in 6 of our population is over 65. In the United States there are now 22 million people over 65 and early in the next century this figure is expected to increase to 50 millions. Little wonder that the young who have to support the more elderly amongst us are becoming concerned. What do they do with this rapidly increasing army of non-productive geriatrics—parasites on a society which they have helped to build?

Unfortunately, this book does not consider the social problems of ageing but it does deal with most other aspects. It is intended for a general audience but a good knowledge of modern biological theory is an essential prerequisite.

The contributors review most areas of interest in fundamental research in gerontology, particularly ageing in cells and molecules, and ageing in plants and lower animals, but there are also substantial sections on ageing in man and on the effects of hormones on ageing. The book concludes with a section on perspectives. As with any book with 25 contributors, the individual articles vary in quality. Some can be read with pleasure, others are rather heavy going, but all provide good background information and each gives a useful reference list for further reading.

Although ageing and death are the inevitable end-results for most metazoa, we still know very little about the mechanisms involved. It is perhaps the most intellectually challenging problem in biology, yet research on ageing forms only a very small part of the major research programmes. Few universities or medical schools consider ageing to be a basic biological process of sufficient importance to form the basis for organised courses.

This book provides an excellent basis for an introduction to modern research on ageing, but it may be somewhat too detailed to serve as a course book.

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John Maddox

Croom Helm wish to apologise to Mr John Maddox for the reference to him in connection with recombinant genetics in their book *Directing Technology*. The publishers (Croom Helm) and the Editors (Ron Johnston and Philip Gummert) and the author of the chapter concerned (Dr Edward Yoxen of the Department of Liberal Studies in Science at the University of Manchester) unreservedly withdraw any suggestions of impropriety in Mr Maddox's role in public discussion of this issue.

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