

Atomic and Molecular Spectroscopy.

Mool Chand Gupta. New Age International (P) Ltd, 4835/24, Ansari Road, Daryaganj, New Delhi 110 002. 2001. 466 pp. Price: Rs 220.

The book under review is fashioned as a textbook of atomic and molecular structure for honours and postgraduate chemistry students. The book aims at fulfilling the need of chemistry students for a concise textbook for understanding the applicability of quantum mechanical principles to chemical systems. It is a culmination of the author's course work in various universities, including BITS Pilani, Tribhuvan University, Nepal and the universities of Gorakhpur and Nagpur.

Atomic and molecular spectroscopy and its applications form a fascinating example of the use of quantum mechanics. The subject also forms a major part of the curricula of most of the universities in India. In that respect, an effort to write a comprehensive book on this subject is quite laudable. However, invariably such an effort and its usefulness will be compared with the popular textbooks like *Modern Spectroscopy* by J. M. Hollas (1986), *Introduction to Molecular Spectroscopy* by Barrow (1962), *Fundamentals of Molecular Spectroscopy* by C. N. Banwell (1993), etc. Such a comparison, though unfair, leaves much to be desired from the present book.

The book is organized in three parts. The first part (chapters 1–5) deals with the basic principles of quantum mechanics and their applications to the atomic and molecular structure and properties. Although much of this is standard textbook material, the presentation lacks precision. For example, the statement (p. 27) of the uncertainty principle as 'the product of uncertainties in position and in its conjugate momentum is greater than a quantity of the order of h (nowadays it is $h/2\pi$)', is difficult to fathom. The scope of atomic spectroscopy in the book is limited to the hydrogen atom and addition of angular momenta for obtaining terms of a few simpler configurations. The second part (chapters 6–12) of the book is concerned with the subject of molecular spectroscopy and includes rotational, vibrational, electronic and Raman spectroscopy, along with discussion on

group theory and applications. While the author has been somewhat successful in treating the subject in a cohesive manner in this part, concepts such as chemical bonding, Born–Oppenheimer approximation and variation principle should have been elaborated in a better manner. The third part (chapters 13–17) of the book deals with resonance techniques such as NMR, NQR, ESR and Mössbauer spectroscopy. The scope of spectroscopy has been widened with the advent of lasers in the 1960s. The textbook is silent about these developments. A textbook on spectroscopy written in 2001 is expected to include discussions on lasers, laser spectroscopy and related topics such as electromagnetic radiation and its interaction with atoms and molecules.

Spectroscopy is largely an experimental discipline. A textbook of this scope must therefore include an adequate discussion on experimental methods. The level of discussion on this topic is not satisfactory in the present book. For example, the discussion on experimental IR spectroscopy (p. 228) starts with a section (§ 8.7) on 'Basic IRD Theory and Design' without explaining the term IRD. Further, it shows a figure of the IR spectrometer and goes on to discuss the Fourier transform spectroscopy instead. The same figure refers to a DTGS detector, without explaining the term. The confusion is further compounded in another section (§ 8.9), which again tries to handle Fourier transform spectroscopy. The IR spectra of simple molecules shown in this book are more like hand sketches which would hardly create any impression on a serious student.

The author should have paid more attention to the organization of the book. For example, electromagnetic spectrum is discussed only in chapter 6, which should have been done in one of the earlier chapters. The term wave-number is used on p. 13 and it is defined on p. 173. The intensity of a line is said to be dependent on the Boltzmann factor on p. 181, while its dependence on the transition probability is stated on p. 195. In the figure depicting the energy-level diagram of a hydrogen atom, the energy scale is not labelled. These are only a few examples of the lack of organization. Also, there are a number of typographical errors, which could have been easily avoided.

A good textbook for graduate and postgraduate students may be expected to fulfil two objectives: First, it should motivate students to acquire basic concepts on the subject and secondly, it must provide enough understanding so that the students can take up reading of specialized reference books and research literature. The present book does not seem to accomplish much on both these counts. It, however, collects in one place most of the information that a student needs to know to cope up with a university syllabus. It provides enough illustrations and solved problems, which surely are useful to a student. The low cost of the book makes it affordable to students. In short, the book takes into account a typical university syllabus on atomic and molecular spectroscopy and it can help students to prepare for such a course work and examinations. Incidentally, that is what is expected of a textbook in our situation.

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Biotechnology: Food Fermentation – Microbiology, Biochemistry and Technology. V. K. Joshi and A. Pandey (eds). Educational Publishers and Distributors, New Delhi. 1999. Vols 1 and 2. 521 pp and 1372 pp. Price not mentioned.

The first volume of the book under review addresses the basic aspects and the second one, the applied aspects of biotechnology. After carefully going through these two volumes, I see that the editors have tried to compile a large amount of information in the area of biotechnology with a clear mandate of biotechnology and biochemistry of fermentation, the microbiology and genetic manipulation of the microorganisms for benefiting the fermentation for getting enriched food products, various types of fermentation and bioreactors as well as the economics and packaging aspects of fermented products and more importantly, the safety of fermented products through microbiological evaluation and evaluation of toxins, focused on in Vol-

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ume I. All the authors are fairly experienced and have done a wonderful job in each chapter and have given an insight into the various aspects of biotechnology of food fermentation. But, it might be appropriate to mention that many of these articles should have been linked to make a meaningful approach for reading by the editors in their preface.

Volume II, which is labelled as 'applied', covers a wide range of products such as the oriental fermented foods, fruit-based fermented foods, fruit and cereal-based beverages, meat products, cereal products as well as production and application of baker's yeast along with production of certain additives by fermentation. Production of even gums, and amino acids and vitamins are all fairly covered and the topic of biomethanation is also addressed. Even though the second volume is supposed to address the applied aspects, the engineering part of fermentation is not fully dealt with. A couple of articles on it would have made the book more comprehensive for reading and advanced information.

Also, a few articles indicating the biochemical mechanisms, comprehensive biochemistry and microbial growth and also the total genetic approach and value addition that can take place by both protein engineering and genetic modification of the cell, would have been appropriate.

Overall, the two volumes certainly cover a large amount of work that has been done in the Indian context and are really a treasure for any biotechnologist and food fermentation scientist.

The editors have to be complimented for trying to put all these in the form of a book which comprises nearly 32 articles backed up by a good index and references under each article and also many tables and figures. I am sure this will be an asset to any library or individual in the subject area of specialization in food fermentation.

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Breeding Field Crops. Chopra, V. L. (ed.). Oxford & IBH Publishing Co Pvt Ltd, 66 Janpath, New Delhi 110 001. 2001. 580 pp. Price: Rs 450.

With the introduction of new technologies, plant breeding has taken a new dimension in food production and consumption. Plant genes can be recombined through sexual crossing, mutated with radiation or inserted through molecular techniques. Among these, the classical methods of shuffling and recombining genes through sexual crossing are the major ones to generate new plant varieties. This position is unlikely to change in the near future till plant genomes are mapped, and large-scale transfer of DNA through parasexual methods becomes a routine practice.

The book under review brings together the vast amount of information on the classical methods of plant breeding. It is a timely and welcome addition to the textbooks for the postgraduate students as well as a source of reference for the plant breeders and geneticists in India and elsewhere. The contributing authors have put together detailed information on the origin, evolution, taxonomy and breeding systems and release of crop varieties of fourteen major crops of the Indian subcontinent. The book covers five major cereal crops – rice, wheat, maize, sorghum and pearl millet and three pulse crops – pigeonpea, chickpea, and mungbeans. Other chapters include oilseed brassicas, soybean, sunflower, groundnut, cotton and sugarcane (the only one in the book propagated from vegetative parts). There is good uniformity in the description of the problems of breeding, and use of germplasm and methodology for solving them in various crops. All contributing authors have drawn heavily from the work of researchers in India that has often been unavailable to the international plant breeders.

A few chapters lack mention of the key contributions by the pioneer plant breeders in India. For example, the contribution by the leading wheat breeder D. S. Athwal who released the very first semi-dwarf wheat variety 'Kalyan Sona' much ahead of the rest of India, has been ignored. He also saw the practical value of the semi-dwarf wheat

varieties in the crop rotation pattern of North India. While the C591 wheat variety prized for its grain and chapati-making quality, bred by late Ram Dhan Singh is mentioned, its role in wheat production over several decades is not sufficiently emphasized. Nor is there any reference to research on alloplasmic lines by S. S. Mann at N. Dakota. There are misspellings, including that in the list of contributors. Some of the terminology used is also misleading, for example 'top-crossing' for breeding Basmati rice! It is also a pity that an important crop such as potato was omitted, since India is the fourth biggest producer of potato in the world. Some authors in the book, however, have omitted many of the important contributions from the rest of the subcontinent, namely Pakistan and Bangladesh which grow the same crops and share similar problems. For example, reference to NIAB-78, a mutation-derived cotton variety, is missing, which has been a major success story in Pakistan. A book title *Breeding Field Crops in India* would have been more appropriate.

The editor V. L. Chopra has personal knowledge of the advances in plant breeding research in India during the past 50 years. He is well aware of the outstanding contributions of the pioneer wheat breeders such as Ram Dhan Singh and D. S. Athwal in India, and of Amir Khan in cotton in Pakistan. There is a need to include information on their singular contributions in a more transparent manner in the subsequent editions of the book. Adding a glossary of basic terms would also enhance the value of the book. Overall, the book is an excellent text, and an essential aid for teaching about the improvement of major crops in the subcontinent. Priced at Rs 450, it is within the reach of every student and researcher of plant breeding and genetics in India.

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