
BOOK REVIEWS

Annual Review of Physical Chemistry, Vol. 39, 1988, pp. 674, (eds.) H. L. Strauss, G. T. Babcock and C. B. Moore, (Published by Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94303, USA), Price: USA, \$32; elsewhere, \$35.

The *Annual Review of Physical Chemistry* has remained one of the most popular and useful review periodicals in physical chemistry. Like the previous volumes, the 39th volume contains a large number of articles (21 in all) on a wide range of topics of interest to physical chemists. Some of the articles are quite interesting and almost all of them are on subjects of current interest.

The first article, entitled "50 years of physical chemistry: a personal account", by S. W. Benson, is a readable account of Prof. Benson's lifelong involvement with physical chemistry. The article contains several episodes of interest to physical chemists, primarily because of their historical nature, involving many famous personalities of the subject. The article also contains a nice historical review of initial experiments on elementary chemical reactions, a field where Prof. Benson has made significant contribution.

There are three reviews on various fields of spectroscopy. M. J. Clouter has reviewed vibrational Raman spectra of simple fluids. This has become an active area of research in recent years because of the relatively recent availability of economical closed-cycle helium refrigerators, which have made liquid-state study of simple molecules such as H_2 and N_2 possible. Raman spectra of simple molecules in gas phase in the critical region and also in dense liquids have been discussed. M. Ito, T. Ebata and N. Mikami have reviewed recent laser spectroscopic studies of large polyatomic molecules in supersonic jets. A readable discussion of technical aspects of supersonic jet spectroscopy is provided. The study of large-amplitude motion and rotational isomerism is discussed. Studies of different types of molecular complexes by this technique are reviewed. S. A. Asher has reviewed UV resonance Raman studies of molecular structure and dynamics with emphasis on application to molecules of chemical and biological interests. Several recent techniques such as saturation

Raman spectroscopy and hyper-Raman spectroscopy have also been discussed.

There are four articles on different aspects of theoretical physical chemistry/chemical physics. R. Schinke has reviewed recent theoretical advances in understanding rotational distributions in direct molecular photodissociation and has compared them with available experimental results. Different limits of coupling between the initial state and the final state are discussed in detail. G. H. Fredrickson has reviewed recent developments in dynamical theories of liquid-glass transition. This field has undergone a renaissance in recent years following the development of mode-coupling theories of relaxation in dense liquids and glasses. Linear and nonlinear response properties of supercooled liquids have been discussed in detail. A readable account of generalized hydrodynamic models and spin models of glass transition have been provided. In an interesting article, P. Meakin has discussed computer models for colloidal aggregation. The article has excellent pictures of clusters generated by computer by simulating different growth models. M. F. Shlesinger has reviewed the concept and applications of fractal time in condensed matter. The application of this concept to relaxation in glassy materials, especially in providing an interpretation of the well-known stretched exponential law, is discussed.

There are four articles on different aspects of chemical reaction dynamics. G. C. Schatz has reviewed the present understanding of quantum effects in gas-phase bimolecular chemical reactions. As the author points out, this field has undergone rapid development in the past ten years. The two main quantum effects, tunneling and resonances, have been discussed in detail for several simple reaction systems. A. L. Harris, J. K. Brown and C. B. Harris discuss the nature of simple photodissociation reactions in liquids on ultrafast time-scales. Both experimental and theoretical aspects of caging dynamics in simple bimolecular reactions (such as $I_2 \rightleftharpoons I + I$) in liquid phase have been discussed. The role of vibrational relaxation in geminate recombination has been discussed in detail. A. R. Ravishankara has reviewed the kinetics of radical reactions in the atmospheric oxidation of CH_4 . The importance of this reaction arises from the fact that methane is

the most abundant hydrocarbon in the Earth's atmosphere. The pathways and mechanism of CH_4 oxidation have been discussed in detail. W. T. Borden, R. J. Loncharich and K. N. Houk discuss synchronicity in multi-bond reactions. A classic example of synchronous reaction is Cope arrangement of 1,5-hexadiene. Results of semi-empirical and *ab initio* calculations have been discussed. Several important reactions are used to establish that multi-bond reactions cannot only be synchronous, but often are synchronous.

There are four reviews on surfaces/interfaces. J. W. Gadzuk has reviewed recent applications of semi-classical methods to molecular dynamics at surfaces. A good introduction to modelling and methodology is provided. K. A. Dill, J. Naghizadeh and J. A. Marqusee present an in-depth discussion of properties of chain molecules at high densities at interfaces. Different theories are compared with the available experimental results. S. T. Ceyer has discussed the dynamics and mechanisms of dissociative chemisorption. A good account of molecular beam technique and different mechanisms of chemisorption of simple molecules on different surfaces, such as Ni[111], Ni[100] and W[110] have been provided. N. Sheppard has reviewed vibrational-spectroscopic studies of the structure of species derived from chemisorption of hydrocarbons on metal single-crystal surfaces.

There are several other articles of interest that should be mentioned. D. G. Cahill and R. O. Pohl present an interesting review of the role of lattice vibrations in heat transport in crystals and glasses. J. L. Skinner has discussed the theory of pure dephasing in crystals. S. O. Smith and R. G. Griffin discuss application of high-resolution solid-state NMR in structural studies of proteins. S. R. Langhoff and C. W. Bauschlicher Jr, present an up-to-date analysis of *ab initio* studies of transition metal systems.

To summarize, the 39th volume of the *Annual Review of Physical Chemistry* contains a large number of useful review articles on fields of current interest. It will be a very welcome addition to any research library of chemical and physical sciences.

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Sustainable Agriculture: Green Manure in Rice Farming, 1988, pp. 379, (Published by International Rice Research Institute, Manila, Philippines), Price: not stated.

The International Rice Research Institute (IRRI), Manila, Philippines, in collaboration with the Commission on the Application of Science to Agriculture, Forestry and Aquaculture, organized a symposium on the role of green manure crops in rice farming systems during May 1987. This publication contains the proceedings of the symposium.

The subject matter under consideration is covered in four chapters, viz. Knowledge and technology, Effects on soil fertility, Integrated use of legumes, and Germplasm collection and seed production. There are 24 review papers authored by experts in the field. Each paper contains a wealth of data and information relevant to the topic of review. Besides these, the editorial committee of the symposium has presented nine pages of symposium recommendations encompassing various aspects of green manuring, thrust areas for future research and conclusions. These are well presented and summarized.

Readers will find that certain aspects are repeated in the review papers. But this helps to emphasize the importance of green manuring for sustainable agriculture. Another aspect that needs emphasis in the practice of green manuring is that it is not applied to supply nitrogen alone. Like any other organic manure, green manure also supplies all the other plant nutrient elements in varying proportions depending on the species of green manure. Besides this, it has additive influence on various physico-chemical and biological properties of soils, on which depend soil fertility and productivity. A wider coverage of this aspect in chapter II for different regions and situations would have been more appropriate. Integrated use of green manure with inorganics in rice farming is of the most practical significance. This aspect also would have been a useful addition to the topic. Nevertheless the publication is comprehensive and well edited, and presents the current thinking on the importance and role of green manure. The chapters have up-to-date references.

Although green manuring is an age-old practice in agriculture and its importance has been realized in great measure, the extent of green manure application has gradually declined in recent times because of several constraints. This tendency must be

discouraged and every attempt should be made to increase the use of green manure. Hence this publication is very timely and useful to all concerned in agricultural development—farmers, students, scientists, planners and decision-makers.

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Post Harvest Pathology of Perishables, by H. K. Dasgupta and N. C. Mandal (Published by Oxford and IBH Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi 110 001), 1989, pp. 623, Price: Rs. 95.00.

This book is the maiden attempt at bringing together scattered information on the various aspects of post-harvest diseases of perishables in India. With its 'all-in-one' approach, the book will be useful as a source-book of information to researchers in this field, as a textbook for students, and for allied reading by plant pathologists, horticulturists, plant physiologists, food and nutritional scientists, post-harvest technologists, agricultural planners, administrators and also to persons engaged in the perishables trade and industry.

The text is arranged in sections to suit the needs of individual readers. After an introductory chapter, the book covers the phenomenon, history, extent of and factors in post-harvest loss; description of more than 400 diseases of fruits and vegetables; etiology; host-pathogen interaction and adoption of pathogens; ecology of post-harvest pathogens, including specificity preference, disease cycle, quiescence, and association between pathogens; and biological control, including resistance to and tolerance of fungicides. There are three appendices on methods of isolation and inoculation, a list of minor pathogens; and classification and synonyms of fruits and vegetables.

Some of the latest desirable information not covered in the book are epidemiology of post-harvest diseases, quality retention strategies for mechanically harvested fresh market fruits, mycotoxins as post-harvest problems. Environmental modification for control of post-harvest decay, and

integrated pest management systems in post-harvest technology are scanty. The authors should also have suggested some topics for future research in post-harvest pathology suited to our needs and to the country as a whole.

The greatest limitation of the treatise is the lack of illustrations (both colour and black and white) which, as admitted by the authors themselves, was in view of the cost. However, these discrepancies should not stand in the way of wide use of the book, since its technical content makes it a must for all involved in post-harvest pathology of perishables.

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Annual Review of Phytopathology, Vol. 26, 1988, pp. 493, (ed.) R. James Cook, (Published by Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94303-0897, USA), Price: USA, \$36; elsewhere, \$ 40.

The volume contains 24 chapters. The prefatory chapter is followed by chapters on pioneers in plant pathology (H. S. Fawcett, T. Taylor, J. E. Vanderplank), soil-borne pathogens, chemical control, races in phytonematology, progress in virology, diagnosis and appraisal of diseases, taxonomy of fungi (*Helminthosporium*, *Phytophthora*), molecular genetics in bacteria, potyviral gene products, abiotic stress, self-protection against bacterial phytotoxins, cloning of plant genes, phenotypes in wheat stem rust, multiple disease resistance in legumes, pyramiding resistance genes, climatic variation and diseases, chemical control of post-harvest diseases and biocontrol of soil-borne pathogens with bacteria.

The volume is dedicated to the memory of Tsune Kosuge, University of California, Davis, who made significant contributions in the areas of biochemistry and molecular biology. Prof. Luis Sequeira accepts, in the prefatory chapter, that the work on auxin inactivation that he did for his Ph.D. was the most innovative one of his career, indicating how important it is to choose a good mentor (Prof. K. V. Thimann in his case) for graduate studies.

Genetic information can be exchanged between different groups of microorganisms. It is hoped that this phenomenon is exploited for various purposes.

Bacterial toxins have target sites in the bacteria that produce the same toxin, but the bacteria also possess mechanisms for self-protection. The question is can these sites be utilized to induce suicides?

It is recommended that phytonematologists drop the use of biotype, race and strains, and instead refer to intraspecific variants as pathotypes to denote a population delimited by its performance in a differential host test. For predicting effect of disease, crop growth-based epidemics and yield loss models are superior to models that do not explicitly model crop growth. Recently, the centenary of Bordeaux Mixture was celebrated. In 1960 only 20 fungicides were available, by 1985 there were 85; but during the last decade no major fungicide has appeared. Apparently, a new approach/vision is required to develop next generation fungicides.

Molecular biology has now placed disease physiology in a new perspective. This new science is method-oriented rather than concept-oriented, but then these methods have revolutionized biology, particularly because they allow meaningful answers to old questions. It is now possible to create mutations that affect single sites in the genome by inserting transposable elements. Useful DNA fragments can be cloned and identified. Eventually the nucleotide sequence of the gene can be determined and the promoter region delineated. The role of a particular gene in pathogenicity and/or virulence can be determined. It is, however, still difficult to

identify the gene product and describe how it functions. It is also not known whether resistance gene expression is constitutive, or whether it is induced by pathogen attack. Basic studies in biochemistry and metabolism must keep pace with the developments in molecular genetics for meaningful conclusions. It, however, appears that cloning of disease resistance genes from plants will be a long-term undertaking. That brings up the question: is the objective worthwhile?

Results in plant pathogens have crossed all subject barriers. For example, the discovery of hormonal induction of sexual reproduction by single parent in *Phytophthora* opens up a new vision, and in the distant future it may be possible, through genetic engineering, to produce animals with reproductive systems that can be hormonally regulated at will. It should also be possible for both men and women to bear "their own" children at any time they desire (even after retirement from active work). Hormonally regulated sexual reproduction by single parent would make child-bearing an absolutely "private event".

This volume is highly recommended to students, teachers and research workers in plant pathology, molecular biology and microbiology.

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