Molecular Biology at Columbia University was supported under NSF Grant DIR-8720229. We thank Dr. Xiaolian Gao for discussions and access to a 600-MHz instrument.

Supplementary Material Available: Table of procedures for estimating distance restraints; a set of figures showing base triple pairing alignments, one-dimensional proton spectra in H_2O and D_2O, expanded NOESY contour plots in D_2O, interstrand NOE correlations, distribution of distance restraints, and superpositioned distance refined structures for the entire triplex and the central segment (11 pages). Ordering information is given on any current masthead page.

*Book Reviews**

Synthesis and Chemistry of Agrochemicals III. ACS Symposium Series 504. Edited by Don R. Baker (ICI Americas), Joseph G. Fenyes (Buckman Laboratories International, Inc.), and James J. Steffens (E.I. du Pont de Nemours and Company). ACS: Washington, DC. 1992. xii + 468 pp. $109.95. ISBN 0-8412-2473-0.

This book was developed from symposia sponsored by the Division of Agrochemicals of the ACS and organized by the editors of this monograph. It is organized like the others in that the first chapters deal with the discovery of new plant control agents, the second section with control of insects, acarids, and nematodes, and the final section with control of fungal diseases. It is introduced by a chapter entitled Progress in a Time of Change, written by the editors, and concludes with an author index, affiliation index, and subject index.

Lange's Handbook of Chemistry. Fourteenth Edition. By John A. Dean (University of Tennessee). McGraw-Hill: New York. 1992. xvi + 1381 pp. $79.50. ISBN 0-07-016104-1.

This edition of the classic handbook is organized under the following sections: (1) Organic Compounds; (2) General Information, Conversion Tables, and Mathematics; (3) Inorganic Chemistry; (4) Properties of Atoms, Radicals, and Bonds; (5) Physical Properties; (6) Thermodynamic Properties; (7) Spectroscopy; (8) Electrolytes, Electromotive Force, and Chemical Equilibrium; (9) Physicochemical Relationships; (10) Polymers, Rubbers, Fats, Oils, and Waxes; and (11) Practical Laboratory Information. There are prefaces to the 14th, 13th, and 1st editions and a 24-page index.

Supramolecular Photochemistry. By Vincenzo Balzani (University of Bologna) and Franco Scandola (University of Ferrara). Ellis Horwood, Ltd.: London (Available in North America from Prentice-Hall: New York.). 1991. 427 pp. $83.00. ISBN 0-13-877531-1.

This book is a most welcome addition to the photochemistry literature. One of its aims is to provide "the concepts for a rational and unified view of supramolecular photochemistry," and it succeeds admirably. The authors are, of course, very well-known to inorganic photochemists around the world. A unique aspect of this work, however, is that it covers both inorganic and organic supermolecules. This is done in a systematic way by comparing, often side by side, examples of both types that have the same number of components and are of similar size.

The term "supramolecular" (adj) is defined as pertaining to systems that are made up of molecular components in the same way that molecules are made up of atoms. The distinction between a "large molecule" and a "supermolecule" (n.) is that the latter retains properties that are related to those of the individual components in addition to acquiring new properties that derive from intercomponent processes. An example would be a linked electron donor-acceptor (DA) assembly in which, e.g., the spectroscopy and electrochemistry are essentially those of the D and A moieties, but the photophysical and/or photochemical behavior reflect(s) interactions that occur because of the juxtaposition of the constituents not only in space but also in energy and time. Other examples abound throughout this well-written and very useful volume.

The first four chapters (Scope and Limitations; Principles of Molecular Photochemistry; Supramolecular Properties; Control and Tuning of Excited-State Properties of Molecular Components) are introductory and comparatively brief. Chapters 5-10 (Covalently Linked Systems: Photoinduced Electron Transfer; Covalently Linked Systems: Electronic Energy Transfer; Structural Changes in Photoflexible Systems; Ion Pairs; Electron Donor-Acceptor Complexes and Exciplexes; Host-Guest Systems) are the most detailed in terms of their subject matter and the citations of the literature. Chapter 11 (Other Systems) discusses some miscellaneous types of systems (e.g., caged ions, catenanes, rotaxanes, helicates, proton-transfer reactions), the photoprocesses of which have generally been studied less extensively than those discussed in the earlier chapters. Finally, Chapter 12 (Photochemical Molecular Devices) provides some very interesting insights into several kinds of practical devices (e.g., electron- and energy-transfer relays, molecular switches, and other electronic devices on the nanometer scale) that might be developed in the future. The stated goal is that each chapter be essentially self-sufficient but, with extensive cross-references, give a unified view of the field. In this the authors have also realized their expectations.

There is something of value here for everyone currently—or considering—working in this rapidly developing area, from the experienced photochemist to the new graduate student. Just as supramolecular assemblies are built from their constituent parts, so too do the research groups working in this field tend to rely on the cooperative skills of chemists with different backgrounds. In this respect the first few chapters of *Supramolecular Photochemistry* will serve as an excellent tutorial for those not already versed in the fundamental principles of electronic spectroscopy and photophysics. The more detailed chapters are of equal value to experts in the photoprocesses of organic compounds who wish to learn about inorganic systems and vice versa.

Naturally, in a work of this complexity (that is, nevertheless, concise) there are some shortcomings. SI units are used in the introductory chapters but tend to be neglected in the detailed discussions. The terminology is generally clear and straightforward, but there are a few clumsy symbols such as "A.B", which represents a linked, two-component species; this abbreviation becomes somewhat cumbersome when it is further punctuated to indicate an excited state or ionic intermediate. Similarly, there are some awkward terms (e.g., "endoergonic" and "exoergonic", page 47) that later revert to their more familiar counterparts ("endergonic" and "exergonic", page 365) and several spelling inconsistencies (e.g., "dyad" in the index but "diad" [*sic*] in the text). The molecular structures tend to be somewhat uneven in appearance and quality, probably because they were taken from the literature.

On a more substantive note, there is very little to criticize in terms of the content. I would have liked to have seen some discussion of the strengths and limitations of dielectric continuum theory to predict reaction energetics when experimental data (e.g., redox potentials) are not available. Similarly, in the otherwise clear discussion of Marcus theory, it would have been useful to inform the novice that it is due to the properties of symmetric parabolae that the activation energy for a weakly coupled, "isoergonic" electron-transfer reaction is exactly one-fourth of the reorganization energy. In a work of this kind, one does not expect an exhaustive review of the literature; nevertheless, the discussion of some topics (e.g., thermodynamics of excited states, Chapter 2) would have been greatly improved if some of the more recent literature had been cited.

The authors and the publisher are to be congratulated for the layout (e.g., chapter headings on even-numbered pages and section headings opposite) and for the liberal use of clear and generally unambiguous figures. There is also a three-page section of frequently used abbreviations for easy reference. Over 1600 papers (through early 1990) are cited in the references at the end of each chapter, and about 2300 names are listed in the author index, although with some duplication in both because of cross-referencing. The subject index is less generous, with only about 500 entries.

Readers will be delighted with the excellent use of English and fluid style, for which the authors are well known. Some of the spellings and sentence construction (especially, "which" vs "that") as well as punctuation reflect the country of publication. There are also a few unusual variations on commonly used words (e.g., "applicative" vice "applied"), but these are minor annoyances. The text is, for the most part, remarkably free of typographical errors, but the author index contains many incorrectly and/or inconsistently spelled names. There is also at least one erroneous journal citation (*J. Chem. Phys.* instead of *J. Phys.*

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*Unsigned book reviews are by the Book Review Editor.

Chem.).

Notwithstanding these minor shortcomings, I highly recommend this book.

John S. Connolly, *National Renewable Energy Laboratory*

Topics in Current Chemistry. Advances in the Theory of Benzenoid Hydrocarbons II. Edited by Ivan Gutman (University of Kragujevac). Springer-Verlag: New York. 1992. x + 226 pp. $98.00. ISBN 0-387-54961-7.

The emphasis of this book is given to the direction of research in which Cyvin and Gutman (separately) gave their most numerous contributions. The first chapter, written by Ivan Gutman on the Topological Properties of Benzenoid Systems, presents some recent results on benzenoid structural features, spectral properties, Kekule and Clar structures, and topological indices. Examples of important structural properties include the concepts of *inner dual* and *excised internal structure.* Inner dual is a graph whose vertices represent the hexagons of a benzenoid system, and excised internal structure, originated by Dias, is a subgraph spanned by the internal vertices of a benzenoid system. The dualist graph concept engulfs the inner dual concept and the two become identical for strictly pericondensed benzenoid systems and the former is extensively used in the third chapter. The excised internal structure is extensively used in the fourth (last) chapter. The reader may wish to consult the work of Balasubramanian (Tempe) and Burdett (Chicago) for example applications of spectral moments on nonbenzenoids.

The second chapter, also by Gutman, is on Total π-Electron Energy of Benzenoid Hydrocarbons and reviews total π-electron energy versus thermodynamic stability, cyclic conjugation, and various topological relationships of benzenoid hydrocarbons. Both of the first two chapters are well written and interesting.

The third chapter, written by B. N. Cyvin, J. Brunvoll, and S. J. Cyvin on Enumeration of Benzenoid Systems and Other Polyhexes, reviews classification and enumeration results of catafusenes, circulenes, helicenes, pericondensed benzenoids, essentially disconnected benzenoids, benzenoids with specific symmetries, and all-benzenoids. The experimental practitioner may be surprised that these authors define dibenzo[*c,g*]phenanthrene, regarded by experimentalists as [5]helicene, as a benzenoid but not a helicene and phenanthro[*c*]phenanthrene or [6]-helicene as a helicene but not a benzenoid. References 78 and 104 of this chapter are identical. Since there are 14 subsections titled *errata* presenting comments on errors made by various investigators including minor ones made by the authors themselves, one must wonder why no comments concerning the very serious errors made in reference 101 by Cyvin and co-workers were made (also refer to ref 33 in the last chapter). The classification and numerical data in this chapter is probably the most comprehensive of its kind to date, and I found the various classifications particularly interesting.

The last chapter, written by J. Brunvoll, B. N. Cyvin, and S. J. Cyvin, Benzenoid Chemical Isomers and their Enumeration, deals with benzenoid enumeration data generated via the excised internal structure/circumscribing principle (and the aufbau principle) according to a formula periodic table. The experimental practitioner will find useful isomer data for given formulas in this chapter. However, at least half the data is less important, since it is for odd-carbon benzenoids that are radicals capable of only transient existence. In Figure 4 of this fourth chapter, Brunvoll and co-workers present five benzenoid structures which they claim cannot be circumscribed and where the latter represent two counterexamples to a criterion which states that the presence of two or more adjacent bay regions is a necessary and sufficient condition to prevent circumscribing. These counterexamples and associated discussion on page 202 are simply wrong, since the last three benzenoid structures ($C_{46}H_{26}$, $C_{42}H_{24}$, and $C_{38}H_{22}$) can all be circumscribed.

Overall, the stated objectives of Editor Gutman have been accomplished. This work is comprehensive and does not duplicate already existing books. The classification scheme in the third chapter is both interesting and novel, and the third and fourth chapters represent an interesting documentary to the kinds of games that some rival research groups can play. Unfortunately, this book presents a relatively one-sided perspective, particularly in the last chapter.

J. R. Dias, *University of Missouri—Kansas City*

State-Selected and State-to-State Ion-Molecule Reaction Dynamics. Part I: Experiment. Edited by Cheuk-Yiu Ng (University of Iowa) and Michael Baer (Soreq Nuclear Research Center). J. Wiley and Sons, Inc.: New York. 1992. 686 pp. $140.00. ISBN 0-471-532584.

This book is another in the series *Advances in Chemical Physics* edited by I. Prigogine and S. Rice. This collection of 8 chapters by 11 contributing authors (edited by C.-Y. Ng and M. Baer) is the first of a two volume review series dealing with the topic of ion-molecule reaction dynamics. This particular book has as a central theme the current experimental techniques employed to elucidate state-selected and state-to-state ion-molecule chemistry and comparisons of these results with existing theory.

The first chapter (by D. Gerlich) is both a scholarly and complete (175 pages!) treatment of radiofrequency fields from both experimental and theoretical viewpoints. Chapters 2 (by S. L. Anderson) and 3 (by J. C. Weisshaar) are concerned with the use of multiphoton ionization to prepare particular reactant ion states for state-specific cross section measurements. The fourth (by I. Koyuano and K. Tanaka) and fifth (by J.-C. Brenot and M. Durup-Ferguson) chapters deal with the uses of coincidence techniques, again for state-selected studies. Chapter 5 concentrates, in great detail, on the instrument considerations necessary for any coincidence experiment. The sixth chapter (by C.-Y. Ng) concerns accurate measurement of state-to-state cross-section measurements for several ion-molecule systems via photoionization. Lastly, the seventh (by J. H. Futrell) and eighth (by G. Neidner-Schatteburn and J. P. Toennies) chapters deal with the time honored technique of crossed beam scattering to probe state-to-state reaction dynamics.

While any anthology might be expected to be somewhat spotty in the treatment of its subject matter, this book is notably complete and should be a welcome and timely contribution to the field. I highly recommend this book for anyone interested in the area of ion-molecule chemistry and look forward to the second volume in this series.

James F. Garvey, *State University of New York at Buffalo*

Good Laboratory Practice Standards. Applications for Field and Laboratory Studies. Edited by W. Y. Garner (Garndal Associates), M. S. Barge (FMC Corporation), and James P. Ussary (Ussary Scientific Services). ACS: Washington, DC. 1992. 572 pp. $89.95. ISBN 0-8412-2192-8.

One might wonder why such a book is still necessary, since GLP requirements have been applied to toxicology testing since 1976. The fact is that most laboratories did not begin to implement these regulations until the 1980s. Parts of the agricultural chemical industry and animal health industry are just beginning to implement GLP's. This very complete reference book will be invaluable for these laboratories.

This is a very useful book for setting up a GLP program or for helping an existing program evolve into a better GLP program. It is written from the point of view of professsionals involved with all aspects of the study of agricultural chemicals. However, it would be equally useful for those interested in studying the metabolism and environmental impact of animal health drugs and human health drugs. It also contains information which would be useful for those studying toxicology.

This book gathers a lot of good information in one place. The appendices contain reprints of the Code of Federal Regulations (CFR) which apply to agricultural chemicals and representative forms used to comply with GLP regulations. The author list and affiliation list could serve as a source of consultants or contract facilities for GLP studies.

The chapters are quite complete and tackle all of the more difficult aspects of GLP: management commitment, specimen chain of custody, development of a quality assurance unit, data audits, validation of computer systems, ecotoxicological field studies, economic impact, and harmonization. In addition, the book covers many of the more routine aspects of GLP, such as preparing SOP's and protocols and conducting valid field studies.

The only quarrel I have with the order of the chapters is that the one on economic impact should have come before the chapter on getting management commitment, because the authors do such a good job of showing that there are benefits as well as costs with becoming a GLP operation, the major one being that the studies should produce data which will be evaluatable and acceptable for a longer period of time. One caution with this chapter is that it states that most efficacy studies are still not GLP. This will not last long, and the group which moves to doing efficacy studies by GLP will be better prepared for the future. This is a useful book for anyone involved with GLP studies.

T. J. Gilbertson, *The Upjohn Company*