Book Reviews

Methods of Biochemical Analysis. Volume 33. Edited by D. Glick (Stanford University). John Wiley & Sons: New York and Chichester. 1988. ix + 540 pp. $49.95. ISBN 0-471-63744-0.

This reviewer feels that an annual specialist review volume should serve one or more of several purposes. For example, the volume can offer truly critical reviews of the literature in more mature research areas, or it can offer a very timely review of a rapidly developing and growing research area, or it can offer reviews that by the incorporation of new insights clarify disputed or hazy research areas, etc. A good review volume probably blends all of these purposes (and others) to give a reasonable compromise for all potential readers.

The fact that the annual review *Methods of Biochemical Analysis* has reached the venerable age of 33 indicates that the editor, David Glick, has balanced the various aims in a very effective manner. As he retires from active editorship of future volumes, Dr. Glick should be congratulated on the success of the series.

Examination of the present volume, Vol. 33, 1988, discloses a good mix of different types of chapters about differing topics. These chapters range in coverage from a "lab manual" type of review, through chapters which review various biochemical systems and how to analyze them, to chapters on the analysis of specific kinds of materials. Given the length of time required for publication of a book, the number of current references in each chapter seems acceptable.

All told, a fine addition to the library reference shelves.

Alan F. Krivis, *University of Akron*

Thermodynamics and Control of Biological Free-Energy Transduction. By Hans V. Westerhoff (National Institutes of Health) and Karel van Dam (University of Amsterdam). Elsevier: Amsterdam and New York. 1987. xxxii + 576 pp. $237.50. ISBN 0-444-80783-7.

This book puts metabolism and free energy transduction into a thermodynamic and statistical mechanical framework. It draws its examples from about half of the kinds of material that are the workstuff of cell biology and membrane science textbooks, plus specialty items such as light-driven energetics and detoxification pathways. Despite the coverage of pathways, mass balances, etc., this treatise is not a biochemical treatise in that it says almost nothing about molecular structure. Enzymes are simply catalysts and control points for conversion reactions and fluxes. As a book for physicists wanting to learn about biological energetics or as a book for the biologist who wants to start getting quantitative about energetics, Westerhoff–van Dam is as good a bridge as any available. However, their book requires a good grounding in classical and statistical thermodynamics if one wants to follow about two-thirds of it. It calls on Heisenberg, Prigogine, Onsager, Lyapounoff, and Langevin without stint but also on Kaiser, Racker, and Pirt. Black-body radiation, nonequilibrium systems, stochastics, response to fluctuations as a bsis of stability, and dozens of concepts and schools of thought are spliced in. The mitochondrion is described (Table 4.3, definitions) by 10 elasticity coefficients, 3 forces, 5 "flows", 19 enzymic flux control coefficients, and 8 other stoichiometric and activity parameters. The treatment is very large in compass, somewhere between a book and a monument. Westerhoff and van Dam are very good at describing the physical picture evoked by their models, enabling the not-so-current reader to grasp what the equations visibly can or cannot account for.

Their writing styles are lively and well sprinkled with rejoinders, names of authors, and instances where van Dam and Westerhoff believe mistaken concepts or interpretations have got loose. The tone is often that of a teacher or lecturer to an audience. The book is imaginatively and well illustrated, but one would like a few more of the short, punchy tables of the kind in Table 3.1, which numerically summarize central data around which the concepts are fitted. It is also very well referenced, but the index is rather scanty in view of the scope. It is well recommended to most "bioenergeticists" and metabolicians, if they have studied intermediate thermodynamics.

Rex Lovrien, *University of Minnesota*

Catalysis at Surfaces. By Ian M. Campbell (Leeds University). Chapman and Hall: London and New York. 1988. xi + 250 pp. $65.00. ISBN 0-412-31880-6.

This reviewer is a surface scientist who wishes he had more time to read about catalysis. We all have used the argument of relevance of surface science to catalysis as a justification in grant applications, to greater or lesser effect. What Ian Campbell has succeeded in doing in this excellent book is to provide a modern road map for the intricacies of current catalytic theory and practice. The pedagogy is, in my view, also excellent. This is very important in dealing in a coherent manner with what might otherwise be simply a collection of unconnected observations. The exposition on the zeolites I found to be particularly clear.

The chapter dealing with the heterogenization of homogeneous catalysts is a valuable introduction to this area that usually escapes the attention of surface chemists. The relationship of this area to enzyme catalysis is also nicely drawn. The author's chapters on industrial catalytic processes are clear and well balanced and flow naturally from the foregoing scientific discussions.

Obviously there are bound to be some quibbles about the area in which this reviewer does research. For example on page 102 it is stated that the angular directions of the diffracted beams indicate the nature of the adsorbed species. Of course they reflect the order in the overlayer and the satisfying of the Laue equations. Apart from this, the book appears to be free of factual errors.

The toughest area to deal with (and the one that gives the typical grant applicant the most trouble!) is to demonstrate that modern surface science methods have actually led to *new* catalysts or catalytic processes. This has not been demonstrated (no fault of the author), but the improvement in understanding is indisputable.

In summary, this is a timely and excellent book that will undoubtedly be used for senior undergraduate or graduate teaching. The author deserves the thanks of teachers and researchers everywhere looking for a modern and succinct account of heterogeneous catalysis.

P. R. Norton, *The University of Western Ontario*

Advanced Inorganic Chemistry, Fifth Edition. By F. Albert Cotton (Texas A&M University) and Geoffrey Wilkinson (Imperial College of Science and Technology). John Wiley and Sons: New York and Chichester. 1988. xvii + 1455 pp. $44.95. ISBN 0-471-84997-9.

As the title indicates, this is the fifth rendition of an inorganic chemistry classic, *Advanced Inorganic Chemistry*. In the Preface, the authors clearly state their unchanging goal: "to provide the student with the background necessary to comprehend current research literature in inorganic and certain aspects of organometallic chemistry". This goal was admirably accomplished in previous volumes. In the fifth edition, the goal has been achieved again, not by inclusion of simple updated appendages on chapters, but by adoption of a new approach and a nearly complete reconstruction of every chapter. The new approach includes the removal of most "theoretical material" that occupied the initial chapters in the previous editions. The authors justify this modification by pointing out that in recent years there has been rapid growth of important descriptive chemistry that warrants systematic coverage and increasing availability of introductory undergraduate-level inorganic textbooks. These factors, together with the need to keep the text to one volume of reasonable length (and weight), have resulted in the omission of most of the physical principles chapters. In one last editorial comment on the issue the authors state "...we have, over the years, become less persuaded of the value of certain types of theorizing". This is a thought-provoking comment that all who teach introductory and advanced inorganic courses should ponder.

The wealth of descriptive chemistry in the text has been appropriately updated. Important advances in most areas have been included, and many exciting recent developments in main group chemistry, organolanthanide and organoactinide chemistry, bioinorganic topics, organometallic mechanisms, and catalysis have attracted special attention. Every chapter has been reorganized and updated, and this has had particular impact on what might be termed "ligand chemistry".

As has been the case with previous editions, this text is well-written and illustrated. Citations to the most recent literature are provided and reference to appropriate parts of previous editions has been made where more lengthy discussions of selected topics are provided. In the final analysis, this is a great text for a number of advanced-level inorganic courses as well as an indispensable reference work for all inorganic chemists. Some instructors who have utilized previous editions as the sole text for upper-division undergraduate inorganic classes may feel somewhat abandoned by the missing sections on physical principles in the fifth edition. Perhaps this will encourage reevaluation of inorganic course contents and course prerequisites. Those instructors who have used the

*Unsigned book reviews are by the Book Review Editor.

previous editions as a supplemental or reference work will find the new volume to be strengthened and still a "must purchase".

R. T. Paine, *University of New Mexico*

Organic Free Radicals. By Hans Fischer and Heinz Heimgartner (Universität Zürich). Springer-Verlag: Berlin and New York. 1988. xvi + 251 pp. $47.90. ISBN 0-387-50129-0.

This is a symposium volume connected with the Fifth International Symposium on Organic Free Radicals jointly organized by the Chemistry Institutes of ETH and the University of Zürich. This symposium volume, however, is unusual in that it was published *before* the symposium took place; the copyright data is 1988, and the symposium was planned for September 18–23, 1988. Thus, this volume contains abstracts, not full talks, of the 15 plenary lectures, and 9 invited talks, and about 95 contributed papers. About 120 abstracts were received, virtually a complete roster of the talks planned. These abstracts suggest that the meeting was intellectually extremely stimulating and that the work presented was of a high quality. The number of groups taking part is impressive as is the vast range of topics that are covered.

This symposium is one in the series of meetings that have been organized in Europe every three years and focus primarily on organic free-radical chemistry. The series started in Sirmione, Italy, in 1974, and then met in France in 1977, Germany in 1981, and St. Andrew's, Scotland, in 1984. This fifth meeting included symposia on three main fields: free radicals in organic synthesis (chaired by B. Giese); free radicals in biological systems (chaired by W. Adam); and electron transfer in radical chemistry (chaired by L. Eberson).

This volume is not a particularly useful purchase for an individual research worker. Each published abstract is limited to 2 pages, and most give very little details. Furthermore, it is clear that all of these abstracts will be published in full form in some journal or another. Perhaps the most useful feature of this volume for Americans is that it presents a list of active research groups in the organic free-radical field in Europe with complete addresses.

William A. Pryor, *Louisiana State University*

Cocaine. An Annotated Bibliography. Volumes I and II. By Carlton E. Turner (University of Southern Mississippi) et al. University Press of Mississippi: Jackson and London. 1988. Volume 1: xxi + 798 pp. Volume 2: 565 pp. $125.00 (set). ISBN 0-87805-382-4 (set).

The first of the two volumes in this work is the bibliography itself, and the second contains the extensive author and subject indexes. The forepages give an interesting historical review that includes stereochemistry, metabolism, detection, etc. The first 94 pages of the bibliography contain the literature before 1950, most of which is essentially only of historical interest. The main bibliography covers the period 1950–1986 and requires 704 pages. It is arranged in alphabetical order of the authors and includes the title of each citation and a sentence or short paragraph to give further insight into its content. Patents and books are included.

The indexes cover the pre-1950 citations by author only. The subject index for the 1950–1986 period is very thorough and well organized and is designed for use by researchers. The main entry "urine", for example, requires $2^1/_2$ pages and is subdivided into secondary, tertiary, and even quaternary entries (e.g., urine: cocaine, analysis, GC–MS).

The book is reproduced from camera-ready copy from (apparently) a real typewriter rather than the dot-matrix printer that one so often encounters in large compendia.

Advanced Ceramics. Edited by Shinroku Saito (Technical University of Nagaoka) et al. Oxford: Oxford and New York. 1988. viii + 278 pp. $65.00. ISBN 0-19-856335-3.

This book is unusual in that it is a collection of translations of articles from Japan, bound as a book, and stated to be the first issue of a periodical *Fine Ceramics* (meaning ceramics of fine grain). It consists of four papers from Robert M. Fulrath Awardees, and 11 "original review papers", plus a 7-page introduction by K. Okazaki of the National Defence Academy. The review papers cover both traditional and innovative ceramics (e.g., pyroelectric sensors and automotive components). A short index of key words and a 5-page section of "Authors' Profile" are included.

Ion-Exchange Chromatography of Proteins. Chromatographic Science Series 43. By Shuichi Yamamoto (Yamaguchi University) et al. Marcel Dekker: New York and Basel. 1988. vii + 401 pp. $110.00. ISBN 0-8247-7903-7.

Undoubtedly, this book will find appreciative readers. However, it is likely to disappoint those who, misled by the broad sweep of the title, might hope to gain basic or even advanced, general insights into the ion-exchange chromatography of proteins. The responsive audience will rather come from biotechnologists with interests focused on the development of optimized procedures conducted on a large scale. For their benefit, the authors set out to "systematize" protein ion-exchange chromatography. The book may well overwhelm the more casual type of protein chromatographer interested in effective, efficient, and often one-time-only separation, even if achieved under somewhat suboptimal conditions. Although the authors claim to "emphasize physical significance rather than mathematical manipulation" (page iii), relevant but only selectively useful theoretical formalism fills roughly one-third of the book. (The definition alone of some 200 symbols fills about 13 pages in an appendix.) But, it should also be noted that there is probably no current, alternative single source in which to find a similarly comprehensive, elaborate and up-to-date presentation of the theoretical underpinnings of protein ion-exchange chromatography.

The logic of the overall organization of the subject matter is mostly clear even if the relative weights given to individual topics appear to be rather subjective. Chapter lengths vary between about 10 and 100 pages. There are disappointing gaps (for example, in the description of currently used ion-exchange materials, in Chapter 7, limited entirely to anion exchangers), and there are frequent redundancies and, somewhat annoyingly, numerous cross-references across several chapters both forward and backward.

The book's value as a general, practical guide is by and large indirect. For example, the chapter on Experimental Methods and Apparatus (Chapter 6) is only about 20 pages in length, addressing numerous practically important aspects in desultory fashion although not, as a rule, without suitable references to the literature. In contrast, the most generally useful chapter—Chapter 8, Factors Affecting Separation Behavior—takes up about one-fourth of the book. But, regrettably, specific information is not always readily locatable as it may be buried under uninformative headings such as "other subjects" or "additional comments" extended over nearly 30 pages of this long chapter. The value of the book for the biotechnologist interested in process optimization lies—apart from the already noted, extensive theoretical treatment (in Chapters 2–5, and elsewhere)—mostly in the final 40 pages, in Chapters 9 (Large-Scale Operation) and 10 (Design Calculation Procedure).

The alphabetized references (more than 300) are generally appropriate and up-to-date. Unfortunately, the index is much too brief and selective; it fails to ensure, reliably, access to specifics.

George Taborsky, *University of California, Santa Barbara*

Isotopes in the Physical and Biomedical Sciences. Labelled Compounds (Part A). Edited by E. Buncel (Queen's University) and J. R. Jones (University of Surrey). Elsevier: Amsterdam and New York. 1987. 516 pp. $335.00. ISBN 0-444-42809-7.

This volume consists of several reviews on various aspects of the labeling of organic and biomolecules with radionuclides. It is suggested that the volume will be of interest to researchers in the fields of organic synthesis, pharmacology, toxicology, medical science, biochemistry, biotechnology, and biosynthesis. The editors have collected a series of reviews by experts in the area of labeled compounds and particular chapters will be of interest to researchers in that area. As is typical in a multiauthor volume, the chapters are of variable quality and appear to have been written over a 3-year period. The lack of recent references is somewhat disappointing in a volume reproduced from camera-ready copy. The two-page index is of no use in identifying particular compounds. Only very general subjects are indexed.

As is discussed in the preface, investigators in many areas of science are interested in the synthesis and applications of compounds labeled with radioactive or stabled isotopes. Over 50% of funded National Institute of Health's grants apply radioactive compounds for at least some of their studies, and in the preclinical workup of the majority of nonradioactive drugs some type of tracer study is carried out. Whether a volume containing chapters as diverse as one on Radiation Induced Methods of Labelling by Peng and The Role of Isotopes in the Development of β-Adrenaceptor Blocking Agents by Allen could be of interest to even a small fraction of the scientists working with labeled compounds is doubtful. An investigator interested in the means of synthesizing a particular radiolabeled biomolecule is much more likely to search *Current Contents* than a chapter in this volume. In spite of the limitations of the volume, some of the chapters are of particular interest. Chapter 6 by Filer on The Preparation and Characterization of Tritiated Neurochemicals contains a section on the determination of the identity, purities, specific activity, and position of the radiolabel in the neurochemicals that should be available to any investigator using a tritiated neurochemical in any in vivo or biochemical assay. Chapter 9 on the Preparation of Radiolabelled Lipids, by V. P. Schevchenko and N. F. Myasoedov of the Institute of Molecular Genetics, the USSR Academy of Sciences, is a review of papers, many of which are unavailable except in the original Russian. This book will be of interest to people whose main research

interests are of the labeling of compounds with isotopes. This group is, however, decreasing in number, and the volume is not likely to be specialized enough for researchers for whom the use of radiolabeled compounds is simply a tool.

Michael J. Welch, *Washington University Medical Center*

Chemical Structure Software for Personal Computers. Edited by D. E. Meyer (Advanced Research Technologies, Ltd.) et al. American Chemical Society: Washington, DC. 1988. xiv + 107 pp. $49.95. ISBN 0-8412-1538-3.

The idea behind this little book is a very meritorious one, namely, to provide a directory of currently available (presumably to the beginning of 1988) software for creating and using chemical-structure diagrams on a PC—mainly IBM (and compatibles) and Macintosh computers in the present context. In principle, it should provide a chemist who has little knowledge of the subject information not only on what is available and what each software package can, or cannot do for her/him, but also with an in-depth evaluation of each individual program and, hopefully, a comparison of their advantages and disadvantages, à la *Consumer Reports* or even *Personal Computing*. It succeeds very well with the first of these two tasks, but not so well with the last two.

The book is divided into 6 chapters: Current Status of Computer-Assisted Drawing of Chemical Structures; Structure-Drawing Software; Graphics Terminal Emulation Software; Structure Management Software; Software for Three-Dimensional Molecular Graphics and Modeling; Special-Applications Software for Chemical Structures. Three appendicies summarize what software is available for what computers, and the industrial and academic prices.

The available structure-drawing software is discussed in chapter 2. Twenty-three different programs are described *very* briefly. In most cases, the write-up here is essentially the same as that provided in the manufacturers' publicity handouts: hardware requirement, price(s), vendor, and a half-page description of what the program will do. Other than providing this information in one convenient place, the only real comparison between the programs is an example of a test structure as drawn using the different packages. This is very useful to the potential user who may prefer some outputs more than others. There is no comparison of the ease of use of the different programs as, for instance CHEMTEXT compared with WIMP for the IBM PC, or ChemDraw compared with ChemIntosh for the Macintosh. It does indicate that CHEMTEXT has word-processing integrated with the graphics program while WIMP does not (though it can now be integrated with PAGEMAKER and WORDPERFECT).

Similar comments may be made about chapters 3 and 4. In chapter 5, the discussion of molecular modeling is slightly more detailed, but the individual program descriptions are still very sketchy. For example, it would have been useful for the potential user to know how long it would take for Alchemy to minimize the energy of a standard test structure on the system recommended, and how did that compare with PCMODEL, for instance? How do the resulting computed structures compare? How "user friendly" are these programs in the hands of a computer-illiterate organic chemist like this reviewer? Chapter 6 summarizes the features of such programs as CASkit, STN Express, and TOPFRAG, which permit one, among other things, to draw a structure on a PC and then search Chemical Abstracts, for example, for that structure.

In summary, I found this book to be very useful in collecting together information on chemical structure software, but not useful in allowing one to make a decision based on a comparison of the pros and cons of each one. Hopefully, subsequent editions will address this question.

Rudy Abramovitch, *Clemson University*

Physical Chemistry. Third Edition. By Ira N. Levine (Brooklyn College). McGraw-Hill: New York. 1988. xvii + 920 pp. $49.95. ISBN 0-07-037474-0.

Levine offers a text in *Physical Chemistry* that "avoids superficial treatment", and throughout most of the book he succeeds admirably. Extreme care in the development of the fundamentals, especially in the subject of thermodynamics, is refreshingly welcome in a modern text. Almost half the book is devoted to thermodynamics (in 14 chapters), about one-fifth to quantum chemistry and spectroscopy, another one-fifth to transport and kinetics, and the remainder to a chapter on solids and liquids.

Many supplementary topics are included, such as discussions of lasers, surface science, bioelectrochemistry, and semi-empirical and ab initio quantum chemistry methods. In addition, historical tidbits on the lives of the main protagonists are interspersed with the material, creating a refreshing window of personal interest for the reader.

The text has been written with the student in mind, with advice on problem solving, end-of-chapter summaries, and a typical six carefully worked-out examples per chapter. SI units predominate, with an occasional use of the atmosphere and the thermochemical calorie. At the end of each chapter there is an extensive collection of problems (40–80), and answers to half of them are provided at the back of the book. There are quite a few problems that stress symbolic manipulation, and only a few that would stimulate the use of a computer, however. Basic programs are provided in the solutions manual for the latter. Extensive supplementary tables of thermodynamic and other properties are scarce throughout the text.

One of the more delightful aspects of Levine's book is that he does not miss a chance to refer the student to interesting discussions of as yet unresolved issues: entropy and life, time entropy, and cosmology are some salient examples. He refers to a wide variety of literature that is likely to be understood by students, such as articles from *Scientific American, Chemical & Engineering News, Time*, and even science fiction in addition to works in standard scientific journals.

The text shines in its exposition of thermodynamics. Appropriate mathematical reviews are included to aid the student with the language, and an unusually good treatment of line integrals is given. The logical foundations of thermodynamics are presented in detail and there is little left to hand-waving arguments. Balance is achieved by omitting derivations that require extensive backgrounds in other subjects, as in the Debye–Hückel treatment of electrolytes. The text routinely shows the student where to go for treatment that relaxes the assumptions or simplifications made in the presentation, and includes good discussions of practical formulas for calculation, such as the Trouton–Hildebrand–Everett rule for entropies of vaporization.

Levine has presented a superb treatment of the quantum theory in his earlier text (*Quantum Chemistry*, 1983), but he seems to have retreated here to a level somewhat inconsistent with his careful development of thermodynamics. One can avoid dealing with differential equations by using ladder-operator methods for the harmonic oscillator and the hydrogen atom or can face them by numerical solution in a computer. The point is that Levine, in doing neither, loses the thread of showing where things come from in this subject, while he maintains it so well in the rest of the text. Perhaps we note here the influence of the present-day debate of the proper weight of the quantum theory in a survey course given that there are too many other subjects to deal with!

The final chapters show some excellent sections. The treatment of the spectroscopy of diatomics is very thorough, and the discussion of NMR and spin–spin coupling is very well done. The initial level of rigor is taken up again in the development of statistical mechanics based on the canonical ensemble.

To summarize, this text can be highly recommended for its careful treatment of the key subjects in physical chemistry. Many difficult choices have to be made in writing a text of this nature, and one can quibble with omissions such as group theory or a discussion of adiabatic demagnetization, yet the quality of what has been included is very appealing.

Sergio Aragon, *San Francisco State University*

Books on Physics and Mathematics

Metal-Semiconductor Contacts, Second Edition. By E. H. Rhoderick (University of Manchester) and R. H. Williams (University College Cardiff). Oxford University: Oxford and New York. 1988. xiii + 252 pp. $65.00. ISBN 0-19-859336-8.

This book is intended to be an up-to-date summary of the progress of metal-semiconductor contacts. Furthermore, the book outlines semiconductor history and theory. The five chapters encompass aspects of the Schottky barrier, metal experiments on semiconductors, current-transport mechanisms, capacitance of the Schottky barrier, and practical contacts. The five appendices cover background information on the depletion approximation, Schottky diodes and p-n junctions, hole quasi-Fermi levels, and contacts to amorphous semiconductors.

The book includes numerous diagrams, graphs, and tables. Many mathematical formulas are used to explain the theories. However, because of the nature of the subject, the symbols can be overwhelming; consequently, a helpful "list of symbols" is included.

The book is intended for the informed scientist having knowledge of physics. The initial explanations on semiconductors are thorough, yet simple enough for a novice to understand. However, after the preliminary background, the book becomes quite advanced theoretically. Because some of the recent technological developments in the field up to 1987 are treated, with special attention to barrier formation, the book is especially suited to semiconductor technologists and physicists.