

tectable (*i.e.*, quantum yield $< 10^{-4}$) reaction to form triphenylpentadiene **1**. This can be understood as a preference for fission of bond a rather than bond b in biradical **8** to give triphenylhexadiene **2**. Also, the lack of central methyl substitution in triphenylhexadiene **2** and the presence of terminal methyl substitution makes the 2,5 bonding more unlikely from entropy and steric vantage points.

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Book Reviews*

Soviet-Urethane Technology. Volume I. Soviet Progress in Polyurethanes Series. Edited by ARTHUR M. SCHILLER (American Cyanamid Co.). Technomic Publishing Co., Inc., Westport, Conn. 1973. vii + 258 pp. \$35.00.

"Soviet-Urethane Technology" should be a welcome addition to the library of polymer chemists and plastics engineers. The book provides a rare insight into some of the Soviet research projects carried on at the Institute of the Chemistry of High-Molecular Compounds of the Ukrainian Soviet Socialist Republic and the All-Union Scientific-Research Institute of Synthetic Rubber.

Although the papers presented in this book are generally of high quality, several sections deserve special attention.

Section II is an excellent summary of some synthetic work which could benefit those doing research in the area of flame-retardant fibers for woven garments.

Section IV could prove valuable to those engaged in producing more thermally stable materials. Thermal stability and dissociation temperatures are discussed under several headings. These would also benefit those scientists and engineers doing work in the area of flammability. The papers which deserve special attention are those which describe methods of increasing thermal stability (Chapter 30), effect of structure on dissociation temperatures (Chapters 31 and 33), thermo-oxidative stability (Chapter 32), and kinetics of dissociation (Chapters 34 and 35).

In Chapters 24 and 25, uv stability of the high molecular weight compounds is an important fact to be considered in coating research.

There is one shortcoming of the book—some of the most interesting articles are too short.

Calvin J. Benning, *International Paper Company*

Molecular Evolution: Prebiological and Biological. Edited by D. L. ROHLFING (University of South Carolina) and A. I. OPARIN (A. N. Bakh Institute of Biochemistry, Academy of Sciences of the USSR). Plenum Press, New York, N. Y. 1972. xix + 481 pp. \$24.00.

"Molecular Evolution: Prebiological and Biological" is a collection of 35 contributed essays and is dedicated to Sidney W. Fox. The 58 contributors cover 10 nations and many disciplines. Category breakdown of contributions in the Table of Contents assigns five (70 pages) to History and Scope, four (50 pages) to Thermodynamic and Philosophical Considerations, four (42 pages) to Micromolecules, twelve (172 pages) to Macromolecules, seven (100 pages) to Protocells and Cells, two (18 pages) to Academic Aspects, and one (3 pages) to Man and Evolution. This accolade to Fox reveals the impact his contributions have made. It is recommended to those who have followed developments in the area and want to be informed on philosophical speculations as well as reviews of experimental data.

J. H. Boyer, *University of Illinois Chicago Circle Campus*

The Porous Structure of Catalysts and Transport Process in Heterogeneous Catalysis. The Fourth International Congress on Catalysis, Symposium III. Novosibirsk. Edited by G. K. BORESKOV (Academy

of Sciences USSR). Akademiai Kiadó, Budapest. 1972. 498 pp. \$14.00.

This volume presents the twenty-seven papers (with discussion) and the text of the plenary lecture given by Professor Boreskov at this symposium, held subsequent to the Fourth International Congress on Catalysis at Novosibirsk in 1968. In spite of the four years lag between presentation and publication, those with research or teaching interests in this field will find this volume most valuable. The papers encompass a wide range of topics including experimental and theoretical studies of catalyst intraparticle transport properties, surface diffusion in adsorbate layers, and the theory of diffusion and reaction in terms of both activity and selectivity effects. Most valuable are the papers presenting experimental data on transport effects in various catalytic systems such as V_2O_5 - SO_2 oxidation, SiO_2 - Al_2O_3 -butene isomerization, supported Ni-aromatics hydrogenation, and others. It is notable that in most of these experimental studies the authors report poor agreement between their theoretical estimates of transport limitation and the actual results.

John B. Butt, *Northwestern University*

Advances in Chemical Physics. Volume XXIII. Edited by I. PRIGOGINE (University of Brussels) and STUART A. RICE (University of Chicago). John Wiley and Sons, New York, N. Y. 1973. x + 358 pp. \$22.50.

Continuing the distinguished tradition of this series of review volumes, this latest book contains six timely articles on selected aspects of chemical physics. The articles and their authors are: "Recombination of Gaseous Ions," by Bruce H. Mahan, a topic of importance to those interested in electrical discharges, flames, etc.; "Vibration \rightarrow Vibration Energy Transfer," by C. Bradley Moore, again an important process in discharges and many other non-equilibrium systems; "ESCA," by David A. Shirley, a thorough review of chemical shifts in core-electron binding energies, their interpretation and calculation by *ab initio* and semiempirical procedures, and a discussion of multiplet splittings in paramagnetic molecules and magnetically ordered solids; "Ab Initio Calculations on Small Molecules," by J. C. Browne and F. A. Matsen, a review concentrating on computational progress on He_2^+ , excited states of He_2 , and LiH ; "Picosecond Spectroscopy and Molecular Relaxation," by P. M. Rentzepis, a description of experimental procedures together with results for several organic molecules; and "Some Modern Aspects of Exciton Theory," by Michael R. Philpott, a detailed and lengthy (114 pp) account of the various theories of single exciton states with zero spin (singlets). The volume is highly recommended to those researchers who wish to become more familiar with the rapid advances in these areas of chemical physics.

Lawrence L. Lohr, Jr., *University of Michigan*

NMR: Basic Principles and Progress/Grundlagen und Fortschritte. Volume 7. By C. W. HILBERS, C. MACLEAN (Vrij Universiteit), and H. PFEIFER (Karl Marx Universität). Springer-Verlag, New York, N. Y. 1972. 153 pp. \$24.80.

This volume continues the philosophy, developed in earlier volumes of this series (except for Volume 4), of presenting material

* Unsigned book reviews are by the Book Review Editor.

dealing with the theoretical and physical chemical foundations for particular experimental techniques in nmr spectroscopy, rather than containing reviews dealing with the particular classes of compounds or chemical problems.

There are two chapters. The first, shorter, chapter (52 pp) deals with the nmr of molecules oriented in electric fields. While this area of research is important in connection with the investigation of polarizability and the structure of the liquid state, it does not have as wide applicability as nmr spectroscopy of molecules oriented using liquid crystals, a topic discussed in an earlier volume of this series.

The second chapter comprising the remaining two-thirds of the volume deals with nmr and relaxation of molecules absorbed on solids. This article provides both a detailed explication of theory and a review of experimental work in the area.

The material in this volume will be of interest to specialists (mainly chemical physicists) in the areas covered rather than to nmr spectroscopists in general. This together with the rather considerable price suggests that most nmr spectroscopists and smaller libraries (except those with extensive chemical physics sections) may not wish to acquire this volume.

Morton Raban, *Wayne State University*

Advances in X-Ray Analysis. Volume 16. Edited by L. S. BIRKS, C. S. BARRETT, J. B. NEWKIRK, and C. O. RUUD. Plenum Press, New York, N. Y. 1973. xii + 410 pp. \$25.00.

The Proceedings of the Twenty-First Annual Conference on Applications of X-Ray Analysis, held in August 1972, are presented in papers reproduced from the authors' somewhat varying typescripts. The 37 papers emphasized X-ray analysis of environmental, biomedical, and forensic applications. The papers are complete, and there is both an author and a subject index.

Annual Review of Materials Science. Volume 2. 1972. Edited by R. A. HUGGINS, R. H. BUBE, and R. W. ROBERTS. Annual Reviews, Inc., Palo Alto, Calif. 1972. ix + 780 pp. \$10.00.

A group of intensive review articles are collected in this volume. Each is illustrated and has a long bibliography. The subject categories are: Structure, Synthesis, Properties, and Special Materials. They include such topics as "Structure of Inorganic Glasses" (R. H. Doremus), "Influence of Pressure on Phase Transitions" (A. Jayaraman), "High-Temperature Gas-Solid Reactions" (D. E. Rosner), and "Highly Dispersed Catalytic Materials" (J. H. Sinfelt). A true author index (as opposed to a list of contributors), an excellent subject index, and cumulative contributor and title indexes complete this useful work, which also appears to deserve first prize for the lowest price per page of any hard-bound book received for review this year.

Biogenesis of Plant Cell Wall Polysaccharides. Edited by FRANK LOEWUS (State University of New York at Buffalo). Academic Press, New York, N. Y. 1973. xi + 379 pp. \$14.00.

This book presents the Proceedings of a symposium held in conjunction with the 164th National Meeting of the American Chemical Society in New York in 1972, sponsored by the Division of Cellulose, Wood, and Fiber Chemistry. There are sixteen papers, photoreproduced from typescripts for rapid publication. The authors' manuscripts have apparently been retyped for uniformity of appearance; the result is pleasing. The papers are well illustrated and are complete with references.

Gas and Liquid Chromatography Abstracts 1972. Edited by C. E. H. KNAPMAN and R. J. MAGGS. Applied Science Publishers, Ltd., Rippleside Commercial Estate, Barking IG 11 OSA, England. 1973. xviii + 230 + 21 pp. \$20.00.

This volume consists of 853 abstracts of papers on gas chromatography and 69 abstracts on liquid chromatography, taken from publications mostly dated 1971. There are also author and subject indexes, and a useful seven-page glossary of trade names and abbreviations for chromatographic materials. The last feature reveals the potentially confusing fact that Florisil is magnesium silicate, but Florosil is aluminum silicate. The abstracts are quite brief and might more accurately be called bibliographic annotations, but are sufficient to indicate the type of content to be found in the article. Many appear to be reduced from *Chemical Abstracts*. The publishers state that this work will no longer appear as an annual volume, but from January 1973 will be produced as a quarterly journal; Volume 16 (1973) costs \$20.00 per year.

Ion-Selective Electrodes. Edited by E. PUNGOR. Akademiai Kiadó, Budapest. 1973. 283 pp. \$8.40.

This volume of unusually reasonable price presents in English seven plenary lectures and ten "discussion papers" presented at a symposium held in Hungary in October 1972. The contributors are predominantly from Hungary and Eastern Europe. There is no subject index.

Luminescence of Crystals, Molecules and Solutions. Edited by FERD WILLIAMS. Plenum Press, New York, N. Y. 1973. xix + 723 pp. \$32.00.

August of 1972 was a prolific month for chemical conferences, and a gestation period of about nine months seems to have settled in as normal for the birth of the almost inevitable book. In the present case, it was a hefty baby indeed that the Conference on Luminescence (Leningrad) spawned. Even so, only 94 of the 135 papers are included.

The papers are all in English, and the preface indicates that the labors of the Editorial and Publication committees in achieving this result were considerable. Some of the papers were omitted, it is stated, because of the "inability of the Editors to penetrate and clarify the author's meaning through the available translation." A parallel publication in Russian is scheduled. An unusual feature is the inclusion of a materials index in addition to a conventional subject index.

Perspectives in Mössbauer Spectroscopy. Edited by S. G. COHEN and M. PASTERNAK. Plenum Press, New York, N. Y. 1973. viii + 259 pp. \$15.00.

The Proceedings of the International Conference on Applications of the Mössbauer Effect, held in Israel in August 1972, are reproduced from typescript in this volume. It is stated that over 90 papers were presented, but only sixteen, principally the invited lectures, appear here. The conference intended to cover applications in physics and biology as well as in chemistry. There is a summarizing address, a list of papers contributed to the conference, and a subject index.

Proceedings of the Royal Institution of Great Britain. Volume 45. Applied Science Publishers, Ltd., Barking, Essex. 1973. vii + 352 pp. £5.00.

This is stated to be the first in a new series of annual volumes. It contains eighteen "Evening Discourses and some ... other lectures," all of which appear to be reviews or presentations of new ideas, as opposed to accounts of original research. Only a few of the subjects can be considered to be chemical, although most will have some interest for chemists. Representative examples are "Fungal Viruses and Their Antiviral Properties" by Sir Ernst Chain, "Lateral Thinking and Creativity" by Edward De Bono, "Photography One Hundred Years Ago" by Arthur T. Gill, and "Making Sense of Music" by H. C. Longuet-Higgins, more familiar to chemists for his works in theoretical chemistry. It is a fascinating collection.

The Properties of Liquid Metals. Edited by S. TAKEUCHI (Tohoku University). Wiley/Halsted, New York, N. Y. 1973. xxiv + 640 pp. \$35.00.

The Science Council of Japan organized the Second International Conference on the title subject, held in Tokyo in September 1972. The Proceedings, consisting of both review papers and accounts of original research, are collected in this volume. There is no subject index, but only an index of contributing authors. It is not clear how much of the original research has already appeared in journals; the authors should realize that publication in book form precludes their right to subsequent journal publication, and that *Chemical Abstracts* does not customarily abstract from books.

Residue Reviews. Volumes 46 and 47. Edited by F. A. GUNTHER and J. D. GUNTHER. Springer-Verlag, New York, N. Y. 1973. Volume 46: ix + 250 pp. \$26.00. Volume 47: vii + 198 pp. \$17.80.

Volume 46 consists of a single, book-length treatment of the problem of residues of organophosphate esters in the meat of edible domestic animals, by K. Kaemmerer and S. Buntenkotter. The detailed coverage contains no less than 162 tables of data. The metabolic chemistry of the various organophosphate esters is given full attention. The references cover 25 pages, and there is a good subject index.

Volume 47 has chapters on soil adsorption and bioactivity of pesticides (R. S. Adams, Jr.), metabolism and degradation of vinyl phosphate insecticides (K. I. Beynon, D. H. Hutson, and A. N. Wright), microbial degradation of insecticides (N. Sethunathan),

and effects of herbicides on the ultrastructure of plant cells (J. LaM. Anderson and W. W. Thomson).

Sintering and Related Phenomena. Edited by G. C. KUCZYNSKI. Plenum Press, New York, N. Y. 1973. xii + 451 pp. \$25.00.

Another conference—in June, for a change—has hatched a book. This one, held at University of Notre Dame, was the Third International Conference on the subject. The papers, reproduced from typescript, are grouped under the headings “Point Defects and Transport Phenomena,” “Grain Growth and Ostwald Ripening” (the subject, oddly, is ceramics, not agriculture), “Sintering,” “Hot Pressing,” and “Applications.” There is much to interest physical, inorganic, and surface chemists here. The Preface is refreshingly engaging. The index is somewhat scant.

Synthetic Methods of Organic Chemistry. Volume 27. Edited by WILLIAM THEILHEIMER. S. Karger A.-G. (distributed in U. S. A. by Albert J. Phiebig Inc., White Plains, N. Y.). 1973. xx + 585 pp. \$127.60.

The latest volume of “Theilheimer,” always eagerly awaited, continues the service of abstracting, organizing, and indexing significant publications dealing with transformations of preparative value in organic chemistry. It contains mostly material “published between 1970 and 1972.” The highly detailed index makes access easy even for those who do not choose to become familiar with the classification system used in the text. A seven-page essay on “Trends in Synthetic Organic Chemistry 1973” is useful orienting reading; it highlights particularly unusual or useful innovations.

The devaluation of the dollar with respect to the mark makes this volume particularly expensive. Unfortunate though that is, it still cannot be gainsaid that it is a valuable library purchase—indispensable for most technical libraries. It should not be overlooked that a work of this kind requires an unusually large amount of work to produce but, in turn, can easily save the user more than its cost in a relatively short time.

Spectroscopy and Kinetics. Edited by J. S. MATTSON, H. B. MARK, JR., and H. C. MACDONALD, JR. Marcel Dekker Inc., New York, N. Y. 1973. 352 pp. \$19.75.

The trouble with computer programming is that it is too creative. Like artists and poets and other creators, computer programmers get so emotionally involved with their brainchildren that objectivity about the place of their creations in the greater world gets lost. Art dealers and poetry publishers handle their sources of supply by rejecting most of what gets submitted to them and paying off only after public demand for the art or poetry is proved. The editors and publishers of the book under review, however, seem to have become emotionally involved with their project too. They present the world of chemistry with a collection of computer projects whose interest and value to other chemists is limited to a trivial fraction of the cost of publication while claiming to have a great product “. . . of value to *all* graduate students and industrial and academic researchers in physical chemistry, spectroscopy, and biochemistry . . .” The disparity between the promise on the dust jacket and the contents is great.

For the record, the contents include the following chapters: Application to Magnetic Resonance Spectroscopy: The Use of the Large Computer in Chemical Instrumentation, by L. Newman; The Calculation of the Optical Properties of Thin Metal Films from Internal Reflectance Data, by E. N. C. Randall and H. N. Marks, Jr.; Applications of Computer Circuitry and Techniques to Kinetic Methods of Analysis, by S. R. Crough; Analog Computer Simulation of Kinetic Models, by J. Janata; The Application of the Monte Carlo Method to Chemical Kinetics, by J. J. Manock; and Integration of Complex Rate Equations Using Infinite Series, by N. C. Peterson and H. J. Butcher. There are some Fortran programs, flow charts, block and detail electronic circuits, experimental and computational results, lists of references, and a neat index.

The spectroscopy chapters are represented to be samples of computer applications to spectroscopic problems, and that is what both of them are. The kinetics chapters are represented to be “a comprehensive discussion of computer application to reaction rate studies.” Ridiculous. The material presented is not of interest to chemists except for Crough’s chapter on kinetic methods of chemical analysis, for occasional teaching purposes, or for the very few people who happen to be so proficient at analog computing and

so near to a large analog computer that it is easier for them to solve a kinetics problem on an analog computer rather than to go the Fortran route. The one computer technique that is, and will be in the future, of considerable general utility for applications in chemical kinetics research (aside from data acquisition, of course) is numerical integration of coupled ordinary differential equations. Two pages are devoted to this topic, giving quite obsolete suggestions and references to mathematics books on the subject.

W. C. Gardiner, Jr., *University of Texas*

Comprehensive Inorganic Chemistry. Edited by J. C. BAILAR (University of Illinois), H. J. EMELÉUS (University of Cambridge), Sir R. NYHOLM (University College, London), and A. F. TROTMAN-DICKENSON (University of Wales Institute of Science and Technology). Pergamon Press, Oxford. Distributor in Western Hemisphere: Compendium Press, Elmsford, N. Y. 1973. Vol. 1: xviii + 1487 pp; Vol. 2: xvii + 1615 pp; Vol. 3: xvii + 1387 pp; Vol. 4: xvii + 1010 pp; Vol. 5: xvii + 715 pp. \$386.00.

Attention is immediately drawn to this treatise by the impressive list of editors and highly qualified contributors from academic institutions, national laboratories, and industrial establishments. The reader should not be disappointed after a closer examination.

The primary impetus cited by the editors for compiling another inorganic treatise is that of filling “a gap in the literature.” This gap is the one which exists between single-volume texts and large multi-volume works which can only be afforded by the larger central libraries. Utility to nonprofessionals and convenience in usage are also cited as important goals. They have been reasonably successful on all these points, but the work is probably still too expensive for some small institutions and laboratories.

The compilation is well organized and satisfactorily indexed. Chapters follow in a logical order based on the periodic table. For each element or family of elements, the authors have obviously followed similar organizational outlines, which include such entries as history, occurrence, preparation, physical properties, analytical chemistry, nuclear chemistry, compounds, and, if appropriate, biological toxicity. This organization contributes significantly to effective reference usage. In content, the work is broad without being sketchy. Although specialized concepts are appropriately introduced throughout the work, the first 45 chapters cover the descriptive chemistry of the elements. On the whole, these chapters do meet the editors’ desires for balanced coverage; however, one exception is strikingly evident. The actinide elements are an important and complex group, but 635 pages are devoted to their descriptive chemistry. This is six times that given to the lanthanides and more than one-tenth of the entire treatise. From a different viewpoint, this chapter probably provides the best compilation of its type for the actinides. Balance is more evident within chapters, where the relative coverage of reactions, structure, and thermodynamics is generally appropriate. The last eight chapters treat some of the broad topics which are independent of periodic restrictions. In addition to the coverage of established areas such as transition metal chemistry (bonding theories, stereochemistry, etc.), carbonyl complexes, organometallic compounds, and cluster compounds, this latter section includes chapters on such nontraditional topics as nonstoichiometry, metal bronzes, and polyanions. Inclusion of these topics adds significantly to the comprehensive nature of the work. Although the change is carefully noted, a potential point of confusion is the placement of Chapter 45, “Actinides,” after Chapter 53.

This treatise is obviously not intended to be an exhaustive review work for presenting the state of the art in inorganic chemistry, but topics are adequately referenced if the reader desires additional information. In a lengthy reference work such as this, a consistently up-to-date coverage is desirable, but understandably difficult to achieve. Some chapters are very current and cite reports which are only two years old; others are at least five years out of date. This work is also somewhat outmoded by the use of traditional units (kcal, A, atm, etc.) instead of the preferred SI units (J, nm, kPa, etc.).

The compilation is indeed an impressive reference work and obviously worth the enormous effort which must have been required for its completion. In light of the editors’ goals concerning size restrictions, the work is very comprehensive. Certainly this treatise is a valuable and significant contribution to inorganic chemistry.

J. M. Haschke, *University of Michigan*