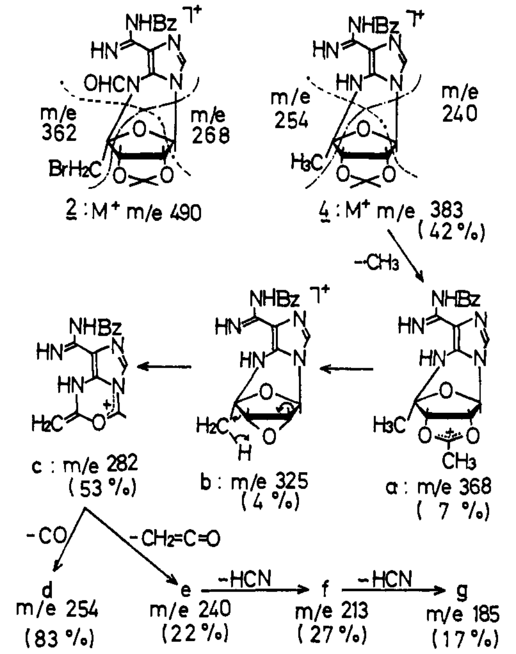
Scheme II



$J_{2',3'}$ = 6 Hz, $H_{3'}$), 5.47 (d, 1 H, $J_{2',3'}$ = 6 Hz, $H_{2'}$), 6.51 (s, 1 H, $H_{1'}$), 6.60–8.15 (m, 6 H, Ph and NH, one-proton part was D_2O exchangeable), 8.17 (s, 1 H, H_2), and 8.81 (s, 1 H, H_8). Treatment of **5** with methanolic ammonia at room temperature for 2 days and subsequent preparative thin layer chromatography gave 9-(2′,3′-*O*-isopropylidene-4′-methoxy-4′-bromomethylene-β-D-erythrofuranosyl)adenine (**6**) in 43% yield: mp 241–243°; ir (KBr) 3420 and 3320 cm^{-1} (ν_{NH}); λ_{max}^{EtOH} 258 nm (ε 13,300); nmr ($CDCl_3$) δ 1.41 (s, 3 H, methyl), 1.68 (s, 3 H, methyl), 3.48 (s, 3 H, 4′-methoxy), 3.70 (br s, 2 H, 5′-CH_2), 5.32 (s, 2 H, $H_{2'}$ and $H_{3'}$), 6.18 (s, 1 H, $H_{1'}$), 6.32 (br s, 2 H, NH_2, D_2O exchangeable), 7.95 (s, 1 H, H_2), and 8.38 (s, 1 H, H_8).[4]

Acid-catalyzed cleavage of adenine is known to give 4-aminoimidazole-5-carboxamidine[5] which can also be derived from adenine 3-*N*-oxide.[5] However, the hydrolysis conditions used are usually too vigorous to be applied to adenosine without depurination.[6] While in our case the plausible intermediate **7** or **7′** could not be isolated, their intermediacy seems to be probable on the basis of an observation that an ice-cold ethyl acetate extract of the reaction mixture became rapidly yellow colored on standing at room temperature.[7] The formation of **2** represents the first N,4′ cyclization with concomitant facile ring cleavage of the base moiety in purine nucleoside derivatives, and would provide a route to a new type of biologically interesting adenine nucleosides.[8]

(4) On heating compound **6** in *N,N*-dimethylformamide at 120° for 24 hr, there was no indication of quaternization at N_3, **6** being recovered unchanged.

(5) M. A. Stevens and G. B. Brown, *J. Amer. Chem. Soc.*, **80**, 2759 (1958).

(6) Interesting rearrangements of N^6-(α-aminoacyl)adenines to *N*-(6-purinyl)amino acids under neutral conditions are described [G. B. Chheda and R. H. Hall, *Biochemistry*, 5, 2082 (1966)].

(7) Attempts to evaporate the solvent at below room temperature were unsuccessful due to a strong solvation which gave invariably heavy gelatinous precipitates.

(8) There was an indication that conjugative stabilization by the benzoyl group assisted the ring opening of the base, since the product of analogous reaction of hypobromous acid on 6-amino-9-(5-deoxy-2,3-*O*-isopropylidene-β-D-*erythro*-pent-4-enofuranosyl)purine showed a normal adenine absorption. Its complete separation and characterization have not yet been achieved.

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Book Reviews*

Absorption Spectra in the UV and Visible Region. Volume XVI. Edited by L. Lang. Academic Press, New York, N. Y. 1972. 400 pp. $29.50.

Each page of this loose-leaf work shows a uv–visible spectrum graphically on one side, and overleaf in numerical form with log I_0/I at 2-mm intervals. The selection of spectra is a very mixed bag of mostly organic compounds, obtained from sixteen references from the period 1968–1972. The order appears to be random, but a separate booklet, carried Kangaroo fashion in a pocket in the back cover, has a name index and a formula index. The system for identifying the investigator responsible for each spectrum, which ought to be very simple for such a small number of sources, is unnecessarily complex and requires one to refer in succession to the figure number, then to the figure index, and then to the literature list. The figures themselves are commendably clear, and comparison is greatly aided by the fact that all are presented on the same scale.

Chemical Investigations for Changing Times. By L. W. Scott, L. M. Zaborowski, J. W. Hill, and P. Muto (University of Wisconsin, River Falls). Burgess Publishing Co., Minneapolis, Minn. 1972. ix + 173 pp. $4.25.

This is an unconventional laboratory manual suitable for an introductory course for students without previous instruction in chemistry. Its main thrust is to motivate students and to convey to those without a professional interest in science some of the enthusiasm that dedicated chemists have. It does so with such experiments as "Cathode Ray Tubes—The Jolly Green Electrons," "Density—Why Oil Floats when the Tanker Sinks," and "Hydrogen Chloride—How to Lose Your Marble." Most of the experiments are said to be readily adaptable for use as lecture demonstrations.

Environmental Engineering and Sanitation. Second Edition. By J. A. Salvato, Jr. Wiley-Interscience. New York, N. Y. 1972. xviii + 919 pp. $24.95.

The author states his aim to be to present in one volume a comprehensive treatment of the subject primarily for teachers and students, but also for all others concerned in some way with environmental health. The emphasis is on practical applications. Although chemistry pervades many of the chapters, it is necessarily handled at an elementary level. There is a very large amount of information of practical reference value presented in tables, from which one can learn, for example, that 0.40 mg/l. of copper sulfate in water is likely to kill catfish, and the average horse produces 12 tons (*sic!*) of "waste" per year. (The annual waste production of the average chemist is not stated.)

Metabolism of the Hypoxic and Ischaemic Heart. Edited by P. Moret and Z. Fejfar. S. Karger AG/Albert J Phiebig Inc., P.O. Box 352, White Plains, N. Y. 1972. xii + 493 pp. $27.45.

The proceedings of a symposium on the title subject held in

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* Unsigned book reviews are by the Book Review Editor.

Geneva in 1971, originally published in eight consecutive numbers of "Cardiology" (60 papers in all), are here reprinted under one cover but without an index.

Organic Reactions. Volume 19. Edited by W. G. DAUBEN (University of California). John Wiley, New York, N. Y. 1972. ix + 434 pp. $22.50.

It has been twenty years since the first of these serial volumes appeared under the editorship of the late Roger Adams, and his inspiration and leadership are acknowledged appropriately in a frontpiece photograph and in the continuing high quality of the contributions. This volume contains chapters on: "Conjugate Addition Reactions of Organocopper Reagents," by G. H. Posner; "Formation of Carbon-Carbon Bonds Via Allylnickel Compounds," by M. F. Semmelhack; "The Thiele-Winter Acetoxylation of Quinones," by J. F. W. McOmie and J. M. Blatchly; and "Oxidative Decarboxylation of Acids by Lead Tetraacetate," by R. A. Sheldon and J. K. Kochi.

An important warning about the carcinogenic nature of bis(chloromethyl) ether and methyl chloromethyl ether, essential reagents in the widely used chloromethylation of aromatic compounds (*cf. Organic Reactions*, Vol. 1), follows the last chapter. The cumulative index of chapters in previous volumes has been helpfully expanded into a "chapter and topic index." The subject index, which follows, applies to Volume 19 alone, although it is mislabeled as an index for Volumes 1–19; it is rather brief.

The Periodic Table of the Elements. By R. J. PUDDEPHATT (University of Liverpool). Oxford University Press, New York, N. Y. 1972. x + 83 pp. $1.95.

This is intended as a supplementary book for students, "to provide, without a detailed discussion of theoretical concepts, an account of the way in which the periodic table is constructed, and of the trends in properties, both physical and chemical . . . ."

Spectral Analysis of Organic Compounds. Second Edition. By C. J. CRESWELL, O. RUMQUIST (Hamline University), and M. M. CAMPBELL (Heriot-Watt University). Burgess Publishing Co., Minneapolis, Minn. 1972. v + 328 pp. $4.95 (paper), $12.95 (cloth).

This is a programmed text in which the principles of ultraviolet-visible, infrared, nmr, and mass spectroscopy are presented in the form of short statements of fact or principle, followed by questions or problems whose answers are given nearby. A substantial section of practice problems in the form of reproduced spectra is included. There is also an appendix of useful data, and an index, which is especially important for finding one's way in a work of this nature. This book is suitable for self-teaching and for undergraduate class use.

Surface and Defect Properties of Solids. Volume One. Edited by M. W. ROBERTS (University of Bradford) and J. M. THOMAS (University College of Wales). The Chemical Society, London. 1972. vii + 264 pp. £ 6.00.

This book is part of a collection of "Specialist Periodical Reports" that eventually will cover the entire field of chemistry, and is the first in a series of volumes that deal specifically with surface and defect properties of solids.

The contributions can be divided into two general groups: those dealing with defect structures in inorganic and organic materials and those concerned with characterization of adsorbed species and reactions on solid surfaces as they relate to catalysis. In the first group, J. S. Anderson discusses shear structures and nonstoichiometry; L. L. Ban describes the use of electron microscopy for the direct study of structural imperfections; C. H. Bamford and G. C. Eastmond consider the role of defects in solid phase polymerization; and J. M. Thomas and J. O. Williams conclude this group with a discussion of structural imperfections in organic molecular crystals.

The group concerned with surface reactions includes a discussion by M. W. Roberts of photoemission as it is applied to the early stages of oxidation of clean metal surfaces; C. R. Brundle provides a general discussion of electron spectroscopy as it applies to surface studies; R. P. H. Gasser describes isotopic exchange and equilibration reactions on metal surfaces; and J. Pritchard and P. B. Wells discuss the application of infrared spectroscopy to surface studies and various aspects of selective action of metal catalysts, respectively.

This volume purports to review the literature published between January 1970, and April 1971; however, the contributors do not limit themselves to this time span, and each of the contributions could serve as a concise, up-to-date introduction to these specialized topics for those well-grounded in the appropriate fundamentals.

R. P. Abendroth, *Owens-Illinois, Inc.*

Inorganic Chemistry of the Transition Elements. Volume I. B. F. G. JOHNSON (Cambridge University), Senior Reporter. The Chemical Society, London. 1972. 417 pp. £ 7.00.

This book marks a new and welcome addition to the Chemical Society's series of "Specialist Periodical Reports." Its scope is limited to the preparation and characterization of transition metal complexes, covering the literature from October 1970 to September 1971.

The four main chapters (and Reporters) are (1) The Early Transition Metals (C. D. Garner); (2) Elements of the First Transitional Period: Elements Manganese-Copper (R. Davis); (3) The Noble Metals (L. A. P. Kane-Maguire); (4) Lanthanides and Actinides (J. A. McCleverty). Chapter 4 is separated into sections on the lanthanides and the actinides. The other three chapters are arranged by element, and discussion of each element is further divided into classes of compounds or complexes. This arrangement, along with the book's thorough treatment of the subject matter and its extensive table of contents (over 8 pages), should prove most valuable to the reader whose interests are centered on particular metals. However, the absence of a subject index—or, more specifically, an index of ligands—makes the task of finding literature references to, *e.g.*, the complexes formed by a particular ligand quite formidable. A subject index would greatly increase the usefulness of future volumes.

As with other titles in this series, an extensive author index (about 4300 names) has been compiled. Unfortunately, references to the review articles listed at the beginning of Chapter 1 and the end of Chapter 3 have been omitted from this list.

Louis J. Kirschenbaum, *University of Rhode Island*

Ring-Disc Electrodes. By W. J. ALBERY and M. L. HITCHMAN (Oxford Science Research Papers). Oxford University Press, New York, N. Y. 1971. xiv + 175 pp. $8.00.

This book deals with the theory and application of ring-disc electrode technique—a subject matter that is of increasing interest to electrochemists, kineticists, and analysts. The first four chapters contain the fundamentals and the theories of mass transport involved in the ring-disc studies. The fifth chapter is devoted to the mathematical treatment of the scheme of squares in elucidating mechanism of complex reactions. The next four chapters contain examples of the application of the ring-disc electrodes to steady-state systems in electrode kinetics and analytical chemistry and in the investigations of the order of reactions in homogeneous kinetics. The tenth chapter is devoted to a useful discussion on the application of ring-disc electrode studies under transient current conditions. The book also contains tables of ring-disc parameters in the appendix. The subheadings of the chapters and the index with literature references provide easy access to information in the book.

The language and the style of the book are simple. However, some portions of the book read as contents prepared for a lecture. Aside from this fact, the organization of the subject matter is good. The book contains many reproductions of illustrations from original publications. This adds to the high technical quality.

The authors provide comments on the limitations of the theory and experiments at the end of several chapters. They also discuss possible areas of research interest. These features, along with the literature references covered up to 1970, serve as exhaustive review for those interested in further investigations on ring-disc systems.

In summation, it may be said that the authors who have earlier contributed to the advances in ring-disc electrode technique through their research papers, have further enlarged the scope of the subject by providing a comprehensive insight through the publication of this book.

M. L. B. Rao, *P. R. Mallory & Company, Inc.*

Physical Methods in Macromolecular Chemistry. Volume 2. Edited by BENJAMIN CARROLL (Rutgers University). Marcel Dekker, New York, N. Y. 1972. viii + 369 pp. $23.50.

The stated aim of this series is "to give the research worker a convenient and up-to-date key to physical and physiochemical methods of particular significance. . . and provide the scientist with the understanding needed to select the most useful method for his research problem." Two of the four chapters in Volume 2 admirably achieve this aim.

Chapter 1, Gel Permeation Chromatography in Polymer Chemistry by D. D. Bly, and Chapter 4, Thermal Methods by E. P.

Manche and B. Carroll, can both be used as handbook guides to the polymer chemist contemplating the utilization of either of these methods in his research. Both chapters are heavily referenced, including citations dated as late as 1971, making them excellent source material. Increased emphasis on the detailed applications of both methods to polymer science would have heightened their value.

Chapters 2 and 3, Interactions of Polymers with Small Ions and Molecules by D. J. R. Laurence, and Electric Properties of Biopolymers: Proteins by E. O. Forster and A. P. Minton, though valuable as review articles on these subjects, do not present or describe recently developed methods of studying the physical properties of polymer molecules. As such, they appear out of place in this series.

Due to the importance and ever increasing use of gel permeation chromatography and thermal methods in the study of macromolecular systems, this volume would be a worthwhile addition to the library of most polymer scientists based solely on the two chapters which cover these modes of investigation.

Alan E. Tonelli, *Bell Laboratories*

Asymmetric Organic Reactions. By JAMES D. MORRISON (Department of Chemistry, University of New Hampton) and HARRY S. MOSHER (Department of Chemistry, Stanford University). Prentice-Hall, Inc., Englewood Cliffs, N. J. 1971. vii + 465 pp. $24.95.

The stated intention of the authors of this book has been to make the review of the topic so complete that others will not need to cover this ground again, but can use this volume as a source and guide to the prior literature. With regard to the empirical evidence of the field, this monograph has reached its goal. There is, however, less emphasis on the presentation and discussion of modern definitions, concepts, and theories. This would have been desirable, in particular, because Eliel's "Stereochemistry of Carbon Compounds" and Mislow's "Introduction to Stereochemistry" to which the authors refer in this context, have appeared in 1962 or 1966, respectively, and are thus not quite current any more.

After an introductory chapter which relates to the history of asymmetric syntheses and gives illustrative examples, the material is presented in three chapters on asymmetric additions to carbonyl compounds, and further chapters on hydrogen transfers, additions to alkenes, syntheses of amino acids and their derivatives, asymmetric syntheses at heteroatoms, asymmetric rearrangements and eliminations, as well as miscellaneous topics.

There are author's and subject indexes. Since asymmetric induction is one of the central issues of dynamic stereochemistry, which pervades many areas of organic chemistry, this book is not only recommended reading and reference material for stereochemists but for organic chemists in general.

Ivar K. Ugi, *University of Southern California and Technical University of Munich*

Eléments de Chimie Quantique. By JEAN HLADIK (Faculté des Sciences de Dakar, Senegal). Dunod, Paris. 1971. xii + 141 pp. 34 F.

This book is a lucid introduction to the principles of quantum chemistry suitable for readers with relatively modest mathematical backgrounds. After the conventional elementary topics on atomic structure and chemical bonding, the final three chapters are devoted to group theory with some elementary applications.

S. M. Blinder, *University of Michigan*

Computer Handling of Chemical Structure Information. By M. F. LYNCH, J. M. HARRISON, W. G. TOWN, and J. E. ASH (University of Sheffield). American Elsevier Inc., New York, N. Y. 1971. xi + 148 pp. $6.50.

It is a pleasant surprise to find among a series of monographs on computer programming a book which is enjoyable and useful to chemists. Despite the numerous and somewhat redundant treatises on the computer handling of chemical *numerical* information, "Computer Handling of Chemical Structural Information" has never before been reviewed in depth. This gap in the literature is particularly odd because computers manipulate molecular structures perhaps more deftly than any kind of information other than numbers themselves.

The authors' presentations of connection tables, fragment codes, line notations, and the like skillfully navigate a difficult channel between useless generality and tedious detail. The hundred-odd references are themselves a useful bibliography to articles which have been widely scattered within and without the traditional literature. Coverage is reasonably thorough. Of particular interest may be descriptions of the existing chemical information systems, whose capabilities are still not widely enough appreciated, particularly in academic circles. This little book should be welcome to chemists, information scientists, and students, as well as programmers, in a wide variety of organizational environments.

Richard D. Cramer III, *Smith Kline & French Laboratories*

Théorie Quantique de la Liason Chimique. By RAYMOND DAUDEL (Centre de Mécanique Ondulatoire Appliquée, Paris). Presses Universitaires de France, Paris. 1971. 183 pp. 19 F.

The principal theme is a conceptual analysis of the chemical bond, drawing upon wave-mechanical concepts, chemical experience, and epistemological considerations. Daudel promotes his own "theory of loges" as the most rational synthesis of the wave-mechanical picture of a molecule—a distribution of indistinguishable, nonlocalizable electrons—with traditional chemical notions of localized electron-pair bonds, inner shells, lone pairs, etc. Briefly stated, "loges" are disjoint regions into which an atom or molecule can be partitioned, such that there is a high probability that each region contains one and only one electron of given spin. The final third of the book discusses some applications of quantum chemistry to chemical reactivity and biological processes, drawn largely from the research of the author and his coworkers.

S. M. Blinder, *University of Michigan*

Nuclear Magnetic Resonance. Volume 1. Edited by R. K. HARRIS (University of East Anglia). The Chemical Society, London. 1972. xviii + 343 pp. £7.00.

This volume of "Specialist Periodical Reports" is the first in a promised series of annual reports covering the topic of nuclear magnetic resonance. The volume is subdivided into ten chapters, each of which presents a critical review of recent literature pertaining to a given aspect of nuclear magnetic resonance. The first volume nominally covers literature from July 1970 to July 1971; however, earlier literature is also discussed as introductory or background material. The literature analyses presented in the several chapters are oriented toward the phenomenon of magnetic resonance rather than to the application of nmr to the study of various classes of chemical compounds. Thus with the exceptions of Chapters 8, 9, and 10 which deal with "macromolecules and solids," "medium effects," and "oriented molecules," Volume 1 is oriented toward reviewing recent developments in magnetic resonance theory and instrumentation. The first seven chapters treat the topics of nuclear shielding, spin–spin coupling, spin relaxation, experimental techniques, analysis of spectra, solution line shapes, and multiple resonance. Somewhat regrettably the topics of Fourier transformation, chemically induced dynamic nuclear polarization, indor, and wide-line nmr are not covered.

The treatment of subject matter in the ten chapters, while necessarily brief, is well organized, reasonably complete, and quite readable; thus Volume 1 provides the magnetic resonance specialist with a most useful guide to selected topics in the current magnetic reasonance literature. The treatment of the several topics is not, in general, of sufficient detail to warrant use of the volume as an introductory text for the nonspecialist. The editor has indicated that certain topics omitted from the first volume will be covered in subsequent editions. Workers in the field of magnetic resonance can look forward to subsequent volumes of the present series and volumes of related series providing a means of keeping abreast of important developments in the ever-increasing volume of magnetic resonance literature.

Larry R. Dalton, *Vanderbilt University*

Thermodynamic Constants of Inorganic and Organic Compounds. By M. KH. KARAPET'YANTS and M. L. KARAPET'YANTS. Translated by J. SCHMORAK, Israel Program for Scientific Translations. Ann Arbor-Humphrey Science Publishers, London. 1970. ix + 461 pp. $20.00.

This book is a tabulation of values of standard enthalpy, ΔH°_{298}, and Gibbs function, ΔG°_{298}, of formation, and standard entropies, S°_{298}, and heat capacities $C_p{}^\circ{}_{298}$ for about 4000 compounds. Values of ΔH°_0, enthalpy of formation at 0°K, are given for some compounds. Each value is accompanied by a literature reference. Magnitudes of the tabulated functions are in some cases approximate values obtained by calculation; however, these approximate values are so designated. The authors regard the compilation as a supplement to earlier works of Britske, Kapustinskii, Veselovskii, Shamovskii, Chentsova, and Anvalr and of Rossini, Wagman, Evans, Levin, and Jaffe which appeared in 1949 and 1952, respectively. Other unnamed reviews were used in compiling the tables. New data are included as well as results obtained by repeating determinations; the authors state that the literature was covered to January 1966.

The elements and compounds are arranged in alphabetical order. The organic compounds are arranged in order of increasing number of carbon atoms. Thermodynamic data for ions in aqueous solution are referred to H^+.

No claim is made with respect to uniformity of choice of standard states for the values tabulated.

Drannan Hamby, *Linfield College*

The Organic Chemistry of Palladium. Volume I. Metal Complexes. Volume II. Catalytic Reactions. By PETER M. MAITLIS. Academic Press, New York, N. Y. 1971. Vol. I: 319 pp. $19.00. Vol. II: 215 pp. $16.00.

Although titled to be about organic chemistry, this two-volume series has not neglected the pertinent inorganic chemistry and begins with a chapter on "inorganic" palladium chemistry and comparisons to its neighbors in the periodic table. Indeed, the general approach of Volume I is that of the coordination chemist. Maitlis frequently contrasts the behavior of palladium with nickel and platinum and describes in considerable detail the structure and function of the metal–ligand complex in the reactions discussed. The organization of the book is based on the ligand unsaturation, beginning in Chapter II with metal–sigma bonds to alkanes and proceeding to alkenes and acetylenes in Chapter III, dienes in Chapter IV, allylic ligands in Chapter V, and aromatic ligands in Chapter VI. Volume I concludes with an author index, subject index, and bibliography containing the nearly 900 citations.

Volume II is slanted toward industrial chemists who are using Pd compounds as catalysts. The emphasis is on the reaction and the products, but the role of the metal complex is described wherever the data allow it. The organization of Volume II is based on the bond being formed or broken in the reaction. Thus Chapter I (the longest chapter) deals with carbon–carbon bond formation and cleavage, Chapter II with carbon–oxygen, Chapter III with carbon–hydrogen, and Chapter IV with carbon–halogen, –nitrogen, –sulfur and –silicon bonds. Each chapter is approximately half as lengthy as the one preceding it, so Chapter V is very short. In it, the subject of heterogeneous reactions is touched upon. Maitlis excludes from consideration in this category all those reactions in which the simple metal is used. This organizational scheme will facilitate use of this volume as a reference work but does obscure slightly the features that various reactions have in common. In most places this drawback will not be noticed. Maitlis does an excellent job of pulling together the diverse information on oxidation of olefins. His treatment of this important topic could provide the basis for a "mini-course" in what the organic chemistry of palladium is all about. Volume II concludes with an author index, subject index, and nearly 600 citations.

These books are clearly for the expert working in the field. For such a person they will be exceedingly valuable reference compilations. If it is surprising that there should be enough literature to allow for a two-volume summation on what was a few years ago an obscure element, it is not less surprising that the author should have succeeded so well in putting it all together.

Paul G. Rasmussen, *University of Michigan*

The History of Valency. By C. A. RUSSELL (Open University, England). Humanities Press, 303 Park Ave. South, New York, N.Y. 1971. xii + 373 pp. $16.50.

This book is a well-written, interesting, abundantly annotated history that could be read by every chemist with profit and pleasure. It consists of four parts. The first is "The Origins of Valency," which begins with the English, German, and French backgrounds and, after separate discussions of the radical theory and the theory of types, ends with a discussion of contested priorities. The second part, "Early Applications of Valency," deals principally with the periodicity of valencies and the early concepts of structure and stereochemistry. The third part, entitled "Variations in Valency," considers the problems associated historically with variable valence and bond multiplicity. Finally, the fourth part deals with "Valency and Electricity" up to the modern period.

So centrally important in the science of chemistry is the concept of valency that the history of its development must almost be a history of chemistry itself. Practically all the famous chemists of the past, whatever their special interests may have been, had firm opinions about valency which they showed little reticence about publishing. This book is replete with direct quotations from their scientific writings, defending their personal views, frequently in polemical style.

All of us need an occasional reminder that authorities throughout history have commonly disagreed, and that it is probably just as possible today as it ever was, for *everyone* to be mistaken on important fundamental issues. But in modern science, unfortunately, "polemical" seems to have become a four-letter word. The present day editorial policy of stifling and censoring controversy seems to imply either that disagreement is really frightfully unmannerly, or that editors and their advisors have a direct pipeline to omniscience that absolutely eliminates any possibility of their being mistaken. It is therefore especially pleasing and refreshing to be reminded that our predecessors allowed each other to be forthright, opinionated, outspoken, and, if necessary, dead wrong, without undue loss of mutual respect. Certainly this attitude, even though it has not always fostered sweetness and light, has been very beneficial to the science of chemistry, for the development of the concepts of valency represents one of the most remarkable of human achievements. Revival of past practice in this respect would seem eminently worthwhile today. We cannot afford to forget that legitimate disagreement and vigorous expression thereof are essential to the health and advancement of all human knowledge.

The book omits metallic bonding, without serious disadvantage to its principal theme. On the other hand, the discovery 60 years ago that the simplest boron hydride is B_2H_6, not BH_3, has been a powerful stimulus to the study of "electron-deficient" bonding ever since. No mention of this important area appears in the book. If as reviewer I felt some additional obligation to be critical, I would express some disappointment that the author has not brought the story as close to the present as he might. I do understand his recognition that we are perhaps too close to recent events to judge them from an appropriate historical perspective. But although he describes the origins of the concept of polar bonds, the author has completely neglected electronegativity, which has been alive for 40 years. By so doing he ignores the immense value of this concept in providing practical understanding of chemistry. Within areas where wave mechanics has been and perhaps will always remain essentially impotent, electronegativity has proven indispensable in explaining quantitatively the formation and energy of bonds and the physical and chemical properties of the elements and their compounds.

Except for such regrettable omissions, the book seems generally excellent, and I believe others would share my enjoyment in reading it.

R. T. Sanderson, *Arizona State University*

Photochemistry. Volume III. By D. BRYCE-SMITH (The University, Reading). The Chemical Society, London. 1972. xiii + 879 pp. £12.00.

The aim of this series is to review the "whole of non-biological photochemistry in a single volume," in this case literature published between July 1970 and June 1971.

Volume III, like the previous members of the series, is organized by division into four broad areas: (I) Physical Aspects of Photochemistry, (II) Inorganic Photochemistry, (III) Organic Aspects of Photochemistry, (IV) Polymer Photochemistry. Each division is further subdivided into related chapters written by the individual Reporters. As one might expect, the bulk of the volume is devoted to Section III but the other areas are by no means neglected.

There is much to recommend and little to criticize in Volume III. Very few papers seem to have escaped the attention of the Reporters. The writing is uniformly good and the presentations clear and, although the coverage is not always detailed, neither is it superficial, extensive use being made of diagrams and data tabulation, so that on balance the volume is well suited for both browsing and light study. Placement of literature references at the page bottoms, rather than at the end of each division, is good and allows one to determine an original source without losing ones place in the text. Errors have been kept to a minimum, and there is relatively little overlap in the coverage of similar topics in different chapters. One relatively minor annoyance is the lack of a subject index; however, a clear and very well-organized table of contents and an extensive author index help to overcome this problem.

This series has become an established publication and anyone with a research interest in photochemistry, or a desire to remain abreast of developments in this rapidly expanding field, will find these volumes indispensable. The price of Volume III, although high, is about average by today's standards.

David S. Weiss, *The University of Michigan*