

lowed by a second endothermic process occurring at 50% (vol) DCA.

An optical titration experiment on this polypeptide in the same solvent mixture and at the same temperature shows no sign of a conformational transition until a 50% (vol) DCA concentration is reached; the collapse of the helix occurs at the same solvent composition as that of the endothermic process.

We interpret the calorimetric results at low DCA content as evidence of the existence of specific hydrogen bonds between the urethane linkages of the carbobenzyloxy groups.^{10,11}

A side chain-side chain interaction of this sort would explain the much lower affinity of the acid for solvating the side chains.

The exothermic process (600 cal/mol of residue) occurring before 50% (vol) DCA without a corresponding change in the optical rotation could be explained only if we accept the possibility of breaking the α -helix hydrogen bonds by DCA solvation and if we further assume that an ordered and DCA-solvated structure of the polypeptide backbone is still maintained with the cooperation of the side-chains hydrogen bonds.

Consequently, the increase of ΔH_{sol} after 50% (vol) DCA, which corresponds to an endothermic process (250–300 cal/mol of residue) and is paralleled by a sharp change in optical activity, could be associated with the disruption of the ordered structure of the backbone by a cooperative breaking of the external hydrogen bonds.

(10) M. Hatano, M. Yoneyama, I. Ito, T. Nozawa, and M. Nakai, *J. Amer. Chem. Soc.*, **91**, 2165 (1969).

(11) M. Hatano and M. Yoneyama, *ibid.*, **92**, 1392 (1970).

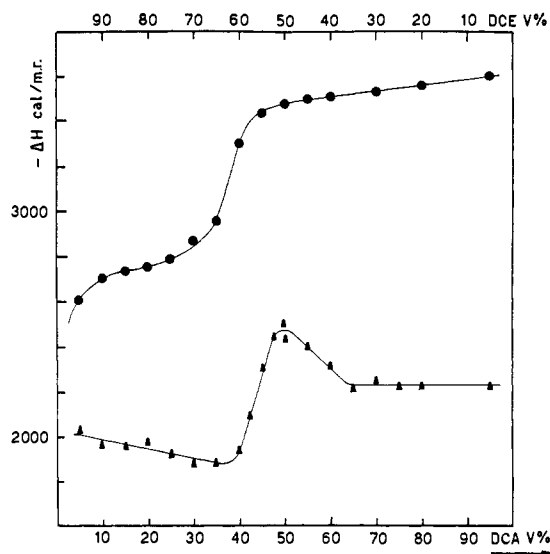


Figure 1. ΔH_{sol} values in DCE-DCA mixtures at 30°: ●, poly(*N*- δ -carbobenzoxy-L-ornithine); ▲, poly(*N*- γ -carbobenzoxy-L- α,γ -diaminobutyric acid). Final polymer concentration always about 2 g/l.

Details on ORD (as well as on nmr) experiments on these polypeptides will be reported elsewhere.

G. Giacometti,* A. Turolla,
Istituto di Chimica Fisica
Università di Padova, Padua, Italy

A. S. Verdini
SNAM PROGETTI, SpA,
Laboratori Ricerche di Base
Monterotondo, Rome, Italy
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Book Reviews

Progress in Phytochemistry. Volume 2. Edited by L. RHEINHOLD and Y. LIWSCHITZ (The Hebrew University of Jerusalem, Israel). Interscience Publishers, John Wiley & Sons, Inc., New York, N. Y. 1970. ix + 512 pp. \$27.50.

The volume under review contains eight articles of interest written by acknowledged authorities in their respective fields.

The first article, by Barbier, reviews the chemistry and biochemistry of pollens. Numerous pollens are known to contain antibiotics, but not antifungal substances. Methods for the collection of pollens and conditions for pollen germination are described. Available data on the chemical composition of pollen are comprehensively reviewed in areas such as vitamins, enzymes, carbohydrates, pigments, lipids, proteins, amino acids, nucleic acids, sterols, and steroids.

The article by Hatch and Slack examines recent progress toward our understanding of the C_4 -dicarboxylic acid pathway of photosynthesis. They present a short history of Calvin's photosynthetic cycle and an account of the events leading to the discovery of the C_4 -dicarboxylic acid cycle. The distribution, regulation, and physiological significance of the pathway are also discussed. This article is especially useful for the nonspecialist interested in a general overview of this subject.

The article by Akazawa briefly reviews the history of Fraction I protein, its identity with RuDP carboxylase, and its structure and function. Its kinetic properties and its localization in the cell are also described. Evidence is also presented that other enzymes are

also present in Fraction I, and the possibility that Fraction I protein may actually be a multienzyme complex is considered.

The relationships between plants, insects, and isoprenoids are analyzed in the article by Herout. Occurrence and functions of monoterpenes, sesquiterpenes, diterpenes, triterpenes, and steroids are considered as they relate to plant and insect physiology. Various isoprenoids are reported to function as feeding attractants or repellents, or are required by the insect as juvenile hormones or molting hormones.

The chemistry, biosynthesis, and occurrence of the nonprotein amino acids of plants are well reviewed by Fowden. Although most of these compounds have only recently been described, they now number over 200. The comparative phytochemistry of these compounds is examined at the family, tribe, and genus level. There is also a discussion of the possible role of nonprotein amino acids as antimetabolites.

The article by Wallwork and Crane describes the nature and occurrence of plant preylquinones and related compounds such as the ubiquinones, rhodoquinone, tocopherolquinone, tocopherol, the plastoquinones, and the benzoquinones. The review of the biosynthesis of those quinones is excellent. Localization of quinones in the cell and the effect of nutrition on quinone concentration are discussed briefly. In the treatment of the roles of some of the well-known quinones, emphasis is placed on that of plastoquinone.

Mapson and Hulme describe the *in vivo* and the cell-free synthesis

of ethylene. They also survey admirably the wide assortment of roles and effects that have been attributed to ethylene such as leaf abscission, growth of roots, shoots, and whole seedlings, apical dominance, auxin transport, and fruit abscission and ripening. Interesting hypotheses on the mechanism of action of ethylene are presented.

The biochemistry of two other groups of relatively new compounds, the Limonoids and the Quasinoids, is reviewed by Connolly, Overton, and Polonsky. The occurrence, chemistry, and biosynthesis of these compounds are discussed with liberal use of structures.

Each article in this volume represents an easy-to-read appraisal of the state of knowledge in this particular area. The volume itself is a valuable addition to any plant biochemist's bookshelf.

Glenn W. Patterson, *University of Maryland*

Molecular Quantum Mechanics. An Introduction to Quantum Chemistry. By P. W. ATKINS (Oxford University). Oxford University Press, London, 1970. xvi + 483 pp in two paperback volumes. \$5.50 each volume.

This textbook is designed for undergraduates, but some subjects such as angular momentum are treated extensively and could be more appropriate at the graduate level. In three parts, Parts I and II are in Volume One and deal with principles, while Part III in Volume Two discusses applications. Part I contains chapters on Historical Introduction, the Schrödinger Equation, and Exact Solutions, while Part II, which is more mathematical and advanced, contains Operators, Group Theory, Angular Momentum, and Approximate Methods. Series solutions are avoided. Operator algebra is used to get the eigenvalues for the harmonic oscillator and for angular momentum. The action principle serves to introduce the Schrödinger equation.

Part III contains Atomic Structure and Spectra, Molecular Structure, Molecular Spectra, and Molecular Properties including principally electromagnetic effects.

The principal defect is the lack of an up-to-date treatment of molecular structure. Although the first sentence of this chapter states "And so we come to what is truly the stuff of chemistry," the treatment is mostly in terms of what was known in the early 1930's.

The style of writing is refreshing and there are many helpful diagrams, problems, and appendices.

Arthur A. Frost, *Northwestern University*

Organosilicon Heteropolymers and Heterocompounds. By S. N. BORISOV (All-Union Synthetic Rubber Research Institute) and M. G. VORONKOV and E. YA. LUKEVITS (Academy of Sciences of the Latvian SSR). Translated by C. N. and T. I. TURTON. Edited by E. G. ROCHOW. Plenum Press, New York, N. Y. 1970. xxi + 633 pp. \$40.00.

It is not often that one comes across a book such as this one. Its scope is big—a broad and complex area of organosilicon chemistry, and one which is expanding rapidly—yet the authors have managed, and managed well, to organize and present in one medium-sized volume an impressive display of the present knowledge in this field. Its eight chapters, one for each major group in the periodic table, cover most of the chemical elements as partners with silicon in compounds of these types. Much useful, factual information can be found in this book, such as synthetic methods, properties, and reactions, and physical data are given for a large number of compounds. The authors have made a point of describing the various applications for particular organosilicon heterocompounds, some of which already are in widespread industrial and domestic use. There also is quite a fair bit of theory presented, certainly enough to tie this diverse field together into a coherent and understandable unity. Extensive coverage of both the technical and patent literatures is made. However, what impresses me perhaps as much as the organization and content of this book is its excellent "readability" (for which the translators and editor likely should be given credit), and I recommend it to others as an example to be followed for its beautifully simple and concise use of the English language to describe difficult and complex chemistry.

In my opinion, this book is a "must" for anyone seriously interested in organosilicon compounds, but it also will be valuable and of interest to a great many people who are concerned with the chemistry of organometallic compounds generally. It is a noteworthy addition to the series of "Monographs in Inorganic Chemistry" of which it is the most recent member.

Dallas T. Hurd, *General Electric Company, Lamp Division*

An Approach to Chemistry. By F. D. DE KOEROESY (Desert Research Institute). American Elsevier Publishing Co., Inc., New York, N. Y. 1969. 380 pp. \$14.50.

This is a masterful presentation of the fundamentals of chemistry up to the level of a senior undergraduate. In any instance, the author starts with the simplest possible description of a process, carries it through its different stages, explains the significance of each step, describes the nature of the resulting product, and draws the conclusions from this experiment on the fundamentals of chemistry and physics. The simple and patient language, the use of adequate comparisons, and the introduction of many well-chosen figures and formulations render the text extremely attractive and stimulating. It is difficult to stop reading once one has started any chapter of this book.

Necessarily, there are many shortcuts and simplifications used but there is not a single oversimplification nor is there any instance where the reader is not familiarized with all basic facts of the problem under consideration. Complicated derivations are avoided, but difficult concepts are clearly formulated and adequately explained.

This book will capture the imagination of all youngsters who are interested not only in chemistry but in natural sciences in general; they cannot fail to become fascinated by the complexity of the individual events and, at the same time, by the simplicity and clarity of the governing laws.

The author deserves to be congratulated for the patience and devotion with which he wrote this text, and he will be doubtlessly rewarded by the resounding acclamation of his book on the part of his colleagues and of the readers of this book.

H. F. Mark, *Polytechnic Institute of Brooklyn*

Ionization, Conductivity, and Breakdown in Dielectric Liquids. By IGNACY ADAMCZEWSKI (Technical University of Gdańsk, Poland). Barnes and Noble, Inc., New York, N. Y. 1969. xv + 439 pp. \$27.50.

Research in the electrical properties of dielectric liquids has involved elements of chemistry, physics, and engineering. In the English edition of "Ionization, Conductivity and Breakdown in Dielectric Liquids," an attempt has been made to systematically order, review, and correlate the relevant literature of these fields. The book "is intended to fill some of the important gaps, namely in the mechanism of ionization, electrical conductivity and breakdown in dielectric liquids," and is addressed to scientists who desire a survey of research developments in liquid insulators.

The book consists of four sections: (1) the general physicochemical properties of dielectric liquids; (2) the action of ionizing radiation; (3) low-field electrical conduction; (4) high-field electrical conduction and breakdown processes. Within each section, information is accumulated from several hundred references dating through 1967, including Polish and Russian works difficult to obtain. In general, theoretical and experimental results are qualitatively discussed or outlined. It is expected that the reader will refer to the referenced source material for detailed procedures, analyses, or explanations.

It is unfortunate that the book has taken so long to reach American audiences. Since it was completed in 1968, there have been several important contributions made to the literature, particularly in the interpretation of low- and high-field conduction processes. Also, the bibliography suffers uniformly from small, but annoying typographical errors. However, these objections are minor in view of the overall effectiveness of the book. In summary, the book presents an excellent review of the state of the art through 1967 and should serve as a useful starting point to new researchers in the field, and as a handy reference guide to more experienced investigators.

Fitzgerald B. Bramwell, *Brooklyn College*