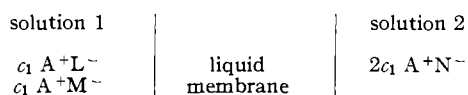


for SCN^- vs. Na^+ . Similar ionic selectivities in the range of 50,000 to 400,000 were obtained for various concentrations of ion-exchange compounds and solutions of different alkali salts at solution concentrations up to 4 *N*. These liquid membranes do not show a decrease of ionic selectivity with increasing concentrations of the adjacent solutions, contrary to the situation prevailing with porous permselective membranes. The *absolute rates of exchange* of anions across the liquid anion-exchange membranes are of the same order of magnitude as those across the most permeable anion permselective membranes studied in our laboratory.² The *ionic selectivities* of the liquid membranes exceed by one to several orders of magnitude the ionic selectivities of even the most highly ion selective porous permselective membranes² at all but the lowest solution concentrations.

Ionic specificity was studied in systems of the type³



L^- and M^- exchanging against N^- . The ratio of the rates of exchange of L^- and of M^- , $\varphi_{\text{L}^-}/\varphi_{\text{M}^-}$, is a measure of the ionic specificity of the membrane for these two ions. Typical ratios were $\varphi_{\text{SCN}^-}/\varphi_{\text{Cl}^-} = 20$, $\varphi_{\text{Br}^-}/\varphi_{\text{Ac}^-} = 25$, $\varphi_{\text{I}^-}/\varphi_{\text{Br}^-} = 2.2$. The sequence of the ionic specificities corresponds to the Hofmeister series, as with porous permselective membranes.³

(2) M. H. Gottlieb, R. Neihof, and K. Sollner, *J. Phys. Chem.*, **61**, 154 (1957); M. Lewis and K. Sollner, *J. Electrochem. Soc.*, **106**, 347 (1959).

The *electrical resistivity* of these membranes is very high. In aromatic hydrocarbons there is a minimum of resistivity with 80–90% of exchange material, about 70 kohms cm.; the resistivity is much higher at lower concentrations, reaching the megohm centimeter range with concentrations of less than 40% of ion-exchange compound in solution.

The *concentration potentials* in cells of the type $\text{KCl} \mid c_1 \text{ liquid membrane} \mid \text{KCl } c_1$ reach the calculated thermodynamically possible maximum values within a few tenths of a millivolt in a concentration range of several hundredths to at least several tenths normal.

*Biionic potentials*⁴ in cells of the type 0.1 *N* $\text{KCl} \mid \text{membrane} \mid 0.1 \text{ N KSCN}$ show that the anion which is more readily adsorbed (higher in the Hofmeister series) than the other, here SCN^- , impresses its charge on the other solution, as with porous permselective membranes. The ionic specificities which can be computed³ from these data agree semiquantitatively with those obtained from rate of exchange studies.

Preliminary experiments with liquid cation exchanger membranes are yielding analogous results.

(3) R. Neihof and K. Sollner, *Discussions Faraday Soc.*, **21**, 108 (1956).

(4) K. Sollner, *J. Phys. Colloid Chem.*, **53**, 1211 and 1226 (1949); S. Dray and K. Sollner, *Biochim. Biophys. Acta*, **18**, 341 (1955).

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BOOK REVIEWS

Enzyme and Metabolic Inhibitors. Volume I. General Principles of Inhibition. By J. LEYDEN WEBB, School of Medicine, University of Southern California, Los Angeles, Calif. Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. 1963. 949 pp. 16.5 × 23.5 cm. Price, \$26.00.

Professor Webb has set himself the task, as he puts it in his preface, "to present concisely the basic principles of inhibition, to describe the actions and mechanisms of the most important and interesting inhibitors, to correlate the actions at the enzyme level with the changes observed in cellular functions, and to provide practical information on the use of these inhibitors." It is clear from this that like all dedicated scientists he is an enthusiast for his chosen field; moreover, as he himself admits a few sentences later, he wants to convert others. This is a formidable task and it takes a scientist of Webb's stature with respect to catholicity of interests and encyclopedic knowledge of his subject matter to even try to make the attempt. In a way, the two aims are self-contradictory and the scope is self-defeating. Any topic which needs four volumes for its presentation, of which the first, dealing with general principles, runs to over 900 pages, overwhelms the reader with its sheer bulk—and price; compendia do not convert make. There are many valuable contributions in this book, and a tremendous amount of work and imagination has gone into its writing; there are ideas and practical suggestions enough to fascinate any enzymologist, chemist, or biologist. But this reviewer fears that the book will remain largely on the reference shelves in the library, rather than on everybody's desk where a thinner, more critical and more selective cousin might claim to

belong. One also feels a little uneasy that among this welter of facts, the book has little or nothing to say about inhibition in the most interesting and fruitful area of biosynthesis; interference with and competition in the formation of functional coenzymes, proteins, or nucleic acids are either not discussed at all or barely mentioned.

Related to this criticism there is another, that of timeliness. This book is meant to deal with fundamental principles of inhibitor action; that is, its crucial and central core is to be found in Chapters 6 and 7, which are concerned with the mechanism of interaction of inhibitors with enzymes and enzyme systems. (The chapters preceding deal with kinetics of enzyme-catalyzed reactions in the presence and absence of inhibitors and the determination of inhibition constants from kinetic data, and Chapters 14 and 15 are concerned with the effect of temperature and other variables on these systems. The other chapters have as their titles: "Distribution and Fate of Inhibitors in Living Organisms," "Inhibition in Cells and Tissues," "Effects of More Than One Inhibitor," and "Localization of the Site of Inhibition.") It is here that Prof. Webb has made his most valuable contribution: pp. 204–318 which deal, in a rigorous, quantitative manner with the physico-chemical parameters determining the strength of interaction not just between enzymes and inhibitors, but between all proteins and small solutes, should be required reading for everybody interested in molecular biology. Unfortunately, however, the book's cut-off date as far as literature review is concerned, occurred some time early in 1960, earlier no doubt for some sections. Now, it is a fact that there has been an almost explosive upsurge of important developments in precisely this

central area since that time. This is the period which has witnessed spectacular contributions to our knowledge of protein structure and conformation, to the nature and function of active sites of transferase, dehydrogenase, and transaminase enzymes, to theoretical and practical aspects of multisubstrate enzyme kinetics, to the mechanism of action of a large number of different types of enzymes, and to the coenzymatic functions of biotin and vitamin B₁₂—and this by no means exhausts the list. All these developments would have some bearing on the central topic of this book. No doubt, analogous developments would have occurred no matter when the publication of the volume; there is always a hiatus between the time when of necessity revision must cease and the actual date of publication, as this reviewer knows only too well. But again, perhaps by being less comprehensive, this lag might have been shortened for the most crucial portion.

In summary then this volume will constitute a valuable reference work for anyone interested in inhibitor action, no matter at what level, and no matter what his field; it accounts well for and interprets sometimes brilliantly developments up to 1960, and it will remain a lasting monument to one man's devotion to one important area in molecular biology, with most of contemporary biochemistry as the backdrop.

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H. R. MAHLER

Handbuch der Analytischen Chemie. By W. FRESENIUS and G. JANDER. **Zweiter Teil, Qualitative Nachweisverfahren, Band IV a α , Elemente der Vierten Hauptgruppe I.** By H. GRASSMANN. Springer-Verlag, VI, Heidelberg Platz 3, Berlin-Wilmersdorf (West), Germany. 1963. 220 pp. 17 \times 25.5 cm. Price, steif geheftet DM 57; ganzleinen DM 61.

Quantitative analysis eclipses qualitative, but from time to time every analyst is confronted with detection problems and requires reliable sources of information on procedure. The second part of the admirable Fresenius-Jander Handbuch consists of a series of volumes on qualitative analysis. This volume, belonging to that part, deals with carbon and silicon. Dr. Grassmann meets the difficulty posed by the coverage of the compounds of carbon by limiting his treatment to "seine wichtigsten einfachen Verbindungen." He includes, besides the element itself, carbides, hydrocarbons (methane, ethane, propane, ethylene, acetylene), the oxides, phosgene, cyanogen, cyanide, thiocyanate, formic acid, acetic acid, and some others. The methods described range from simple precipitation and color reactions to those of the modern analytical armamentarium: spectrography in all its forms, mass spectrometry, gas chromatography, neutron activation, etc. The presentation is compact; literature citations are ample.

The section on silicon, approximately 50 pages, deals with the detection of the element, silicic acid, quartz and other oxides, and silicates in general and some in particular. Full use is made of physical methods, but much can still be done by classical slide and color reactions, and these are not neglected.

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Characteristic Frequencies of Chemical Groups in the Infra-Red.

By M. St. C. FLETT, Research Chemists, Imperial Chemical Industries, Ltd. (Dyestuffs Division), Blackley, Manchester. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York 17, N. Y. 1963. ix + 98 pp. 13 \times 19.5 cm. Price, \$4.50.

The author of this monograph rightly points out in his Preface that infrared spectroscopy is a completely established tool in the armamentarium of the modern organic chemist and that the wide spread availability of simple infrared spectrometers in research laboratories has confronted such workers with the need to reliably translate infrared spectra of organic compounds into useful structural information. This monograph is a contribution designed to aid those to whom infrared spectroscopy is not an end in itself but rather a means to an end, namely structural analysis.

In the opinion of this reviewer the subject monograph, in the main, achieves its author's goal and will be a welcome and much used desk reference in the organic laboratory, especially for those who want quick access to correlation charts of the characteristic frequencies of chemical functional groups or to literature references dealing with the salient spectral features of specific classes of commonly encountered organic compound types.

The advice provided by the author in his Introduction is good and should be heeded by the user. The provision of both wave number and wave length scales throughout the text was wise and allows for easy use by members of both schools of thought. One wonders why the author elected to consider only the carbonyl frequencies of anhydrides and esters as strong absorbers (use of heavy, black, vertical lines) and not such classes as the ketones, carboxylic acids, and amides in view of the fact that later in the text as on pp. 48, 34, and 22, A or ϵ values are provided which show these to be commensurate in intensity with the anhydrides and esters. The degree of precision used in indicating the positions of the absorptions bands throughout the text is often inconsistent, excessive, and certainly unnecessary. Figures good to one part in 8000 are sometimes used in expressing the wave length when the frequency is only known to one part in 1100, e.g., items *d* and *e* on p. 45. Also inconsistent are the references to band ranges as 745–730 (13.4–13.7) in one instance and 1312–1330 (7.62–7.52) in another on the same page (e.g., 43). The characteristic frequency values quoted for the various chemical functions appear reliable and, where uncertainties exist, these are indicated. Considered as a whole, the format of this monograph is good and the text free of typographical errors (only one was found on p. 54 where hydrocarbons was misspelled). The Table of Contents and Index seem adequate and material easily found even without their use. The cost is sufficiently low to make it easily accessible to all having need of it. This monograph, while no substitute for such texts as Bellamy's "Infrared Spectra of Complex Molecules" and Jones and Sandorfy's "Chemical Applications of Spectroscopy," should nevertheless find its way to every organic chemist's shelf as a ready reference.

MERCK SHARP AND DOHME RESEARCH LABORATORIES
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Progress in Physical Organic Chemistry. Volume 1. By SAUL G. COHEN, Department of Chemistry, Brandeis University, Waltham, Mass., ANDREW STREITWIESER, JR., Department of Chemistry, University of California, Berkeley, Calif., and ROBERT W. TAFT, Department of Chemistry, Pennsylvania State University, University Park, Pa. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. ix + 411 pp. 16 \times 23.5 cm. Price, \$15.00.

This is the first volume of a new series which aspires to become a forum for exchange of views and for critical and authoritative reviews. Physical organic chemistry is described as being concerned with investigations of organic chemistry by quantitative and mathematical methods.

This first volume comprises five chapters: "Ionization Potentials in Organic Chemistry," by A. Streitwieser, Jr. (30 pp.); "Nucleophilic Aromatic Substitution Reactions," by S. D. Ross (44 pp.); "Ionization and Dissociation Equilibria in Solution in Liquid Sulfur Dioxide," by N. N. Lichtin (34 pp.); "Secondary Isotope Effects," by E. A. Halevi (114 pp.); and "Quantitative Comparisons of Weak Organic Bases," by E. M. Arnett (182 pp.)

These chapters differ in character, from the first chapter's illuminating focus on the main features of a rather new field, to thoroughgoing reviews in the last two chapters. Nevertheless, each is a valuable contribution in its own way. The series is off to a good start. (This reviewer will, however, offer criticism in another context of certain judgments in one of the chapters.)

Clearly, every library with an organic chemistry collection should possess this book.

Despite the quality of this volume, success is not promised either for the volume or for the series. That it will be financially successful for the publishers seems certain. Library sales alone, at this rich price for a slim volume, will no doubt more than cover costs. Perhaps the publishers have thought of this. But that it will be successful as a medium of communication is doubtful.

Were this series the only one of its type catering to the field of physical organic chemistry, it would perhaps become the forum