BOOK REVIEWS

Modern Instruments in Chemical Analysis. First Edition. By FRANK M. BIFFEN, B.Sc., F.R.I.C., Research Specialist, Johns-Manville Corporation, and WILLIAM SEAMAN, M.S., Ph.D., Research Fellow, American Cyanamid Company. McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N. Y. 1956. ix + 333 pp. 16 × 23.5 cm. Price, $7.50.

The announced objective of the authors is to provide information for the general analytical chemist, and for others, regarding many of the leading physical principles and the instruments that are very frequently employed in chemical analysis. In spite of the somewhat different purposes and orientation, this book compares very favorably, as to scope and manner of treatment, with the three leading books of similar character that are more specifically aimed toward instruction in university courses.

The authors have concentrated their attention primarily upon photometric methods, electrical techniques and radioactive measurements.

After a brief consideration of the electromagnetic spectrum, chapter 1, the succeeding seven chapters deal, respectively, with: 2. Emission spectrographic methods. 3. Flame photometry. 4. Visible and ultraviolet absorptiometric methods. 5. Infrared spectroscopy. 6. Raman spectroscopy. 7. Mass spectrometry. 8. X-Ray diffraction. Five of the remaining chapters deal with electrical methods: 9. Survey of electroanalysis. 10. Polarography and amperometric titrations. 11. Potentiometric analysis. 12. Conductometric analysis, including the high-frequency method. 13. Coulometric analysis. The concluding chapter is: 14. Radioactivity.

Some topics that might have been expected have been omitted, as for example, fluorimetry as applied to solutions and solids, thermal methods such as enthalpy (thermometric) titrations and thermal conductance measurements. The latter topic has become of great importance in connection with vapor-phase chromatography.

In general, each chapter and each major topic is treated briefly and clearly, with generous use of line drawings and photographs of major features of the instruments. A good selection of reference books and selected journal articles is included in a rather extensive bibliography at the end of each chapter. This feature will enable the technical man to go fully into the more detailed aspects of any of the subjects that are treated.

The book is very readable, and the general composition is very good and quite free from misprints and other defects of manufacture.

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Ion Exchange and Its Applications. Papers read at the Conference in the William Beveridge Hall, London University, 5th–7th April, 1954, with the discussions that followed. Society of Chemical Industry. The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. 1956. 173 pp. 22 × 28 cm. Price, $7.50.

This book is a set of some twenty review papers, each on somewhat different aspects of the field and written by different authors, with apparently no or little editing. Inevitably then, one encounters a considerable amount of duplication; the space allotted to each topic is often not commensurate with its extent or importance, and the contributions are of rather uneven quality.

The first section on *theoretical aspects* begins with a paper on the synthesis and general properties of resins; this is the best, short discussion of the topic this reviewer has seen. The paper on ion-exchange equilibria appears to skim over the more fundamental concepts, concentrating too much on the more formal but less informative contributions. Little information is given for the reader interested primarily in practical applications. Ion-exchange kinetics are discussed briefly and in general terms. The paper on column operations is essentially a review of the elegant contributions of its author, but does not mention the more simple treatments of other authors which lead to equally good values for calculated theoretical plate heights. The practical aspects of rate phenomena are, unfortunately, ignored.

The section on *industrial applications* includes two papers on water treatment and demineralization, both of which are so vague and general as to be of little practical value. The following two papers on the recovery of copper and on metallurgical applications contain interesting information, but are too brief and too general in nature.

The section on *inorganic and analytical applications* contains an introductory paper on analytical aspects, one which is entirely vague and often misleading. An article on the recovery of gold from cyanide solution is excellent. It shows how to attack the problem of the separation of a complex system, going from the laboratory through the pilot plant to plant operation. An article on the use of resins for concentrating traces of dissolved metals for analytical purposes is interesting, but its subject matter is so limited that it does not merit the accorded space. This section continues with an excellent review of continuous ion-exchange processes, presented in an authoritative and well documented manner. The subsequent article on the use of resins in the study of complex ions, where the resin is used either as a sorbent for an ion or for one of its complexes, is similarly authoritative. A much too brief summary of the use of membranes for desalting purposes concludes the section.

The section on *organic and biochemical applications* starts with a contribution dealing with amino acids, peptides and proteins, one which summarizes the older work well but devotes only a short section to the recent and most successful methods. Two brief and excellent reviews of applications to the wine industry and to medical practice follow. The summary of cation-exchange processes in soils does not attempt to relate these phenomena with other, related topics in the book.

This section is concluded with three papers: the first an excellent review on the separation of nucleic acid degradation products; the second a short description of dye purification processes making use of the "sieve" effect; the third a résumé of ion-exchange methods for the separation of alkaloids.

Each paper is followed by its discussion. It is here that the lack of editing is particularly felt, because so much of the discussion centered on questions to which there was no answer.

These papers understandably stress British contributions in this field, but space limitations mean that this is often done at the expense of equally valuable work by others. Further, most of the contributors devote entirely too much space to historical introductions and to material covered by other papers, with the result that about one-third of the available space is wasted. This being the case, the price of this book seems too high.

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Tables of Chemical Kinetics, Homogeneous Reactions. National Bureau of Standards Circular 510, Supplement 1. National Bureau of Standards, Office of Technical Information, Washington 25, D. C. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. xiv + 472 pp. 23 × 29 cm. Price, $3.25.

This present supplement to "Tables of Chemical Kinetics" covers work up to 1953 on Rearrangements, Isomerizations, Condensations and Solvolyses, including much work published prior to 1951 but not presented in the original volume. Exhaustive search of American and British journals only is claimed, but since articles cited in these are also included, the coverage is actually much wider. To each table is appended a section of comments which amplify and explain the data given in the table. These com-

ments are usually very much to the point and make it clear that this is not an uncritical compilation of published data.

The problem of devising a suitably flexible and rational system of classification for a work such as this is a formidable one. The task is made doubly difficult by the frequent failure of authors to ascertain the products of the reactions they study kinetically. On the whole, the present system is a reasonable one although it occasionally results in unusual juxtapositions and, conversely, sometimes separates reactions that belong together. One finds, for example, that "Ester Solvolysis" includes displacements effected by added reagents or by the conjugate base of the solvent. In contrast to this, the ethanolysis and acetolysis of sulfonate esters are tabulated separately under "Ester Solvolysis" and "Ester Exchange," respectively. The classification of alkyl halides as "esters" is somewhat distressing to an organic chemist. Indeed, the section on "Ester Solvolysis" could stand a considerable overhaul in organization, since in its present form it covers a very large and rapidly expanding field.

The above comments are intended mainly to warn the reader that he may not always find what he seeks where he expects to find it. Obviously, no conceivable system of classification would please everyone. Many possible objections could be met by an alphabetical index expanded to include extensive cross listings according to type of reaction, of reactant(s) and of product(s). One hesitates to suggest additional work to the authors, who are to be congratulated for their willingness to undertake the arduous task of compiling this work, but such an index should add greatly to the usefulness of the "Tables."

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Rauwolfia: Botany, Pharmacognosy, Chemistry and Pharmacology. By ROBERT E. WOODSON, JR., Ph.D., Professor of Botany, Washington University, Senior Taxonomist, Missouri Botanical Garden, HEBER W. YOUNGKEN, Ph.D., Sc.D., Phm.D., Research Professor of Pharmacognosy and Botany, Massachusetts College of Pharmacy, EMIL SCHLITTLER, Ph.D., Director of Research, CIBA Pharmaceutical Products Inc., Summit, New Jersey, and JURG A. SCHNEIDER, M.D., Director of Physiology Research, CIBA Pharmaceutical Products Inc., Summit, New Jersey. Little, Brown and Company, 34 Beacon Street, Boston 6, Massachusetts. 1957. xii + 149 pp. 16 × 24 cm. Price, $5.50.

In the fourth edition (1949) of Henry's "The Plant Alkaloids" 5 pages and 49 references sufficed for presenting the chemistry and pharmacology of the seven rauwolfia alkaloids known at that time. Except for rauwolscine, which had been identified as a yohimbine isomer, their structure chemistry was as yet uncharted territory. Their pharmacology was on the whole unexciting and held little promise of therapeutic utility. While extracts of *Rauwolfia serpentina* were known to exert hypotensive and sedative effects, it was not clear whether these were due to an alkaloidal constituent. In the intervening 8 years, and particularly since the discovery of reserpine by Mueller, Schlittler and Bein (1952), this picture has changed radically. More than 40 alkaloids isolated from Rauwolfia species are now on record, and the structures of a great majority of these have been elucidated. Only last year we have seen these achievements culminate in Woodward's brilliantly conceived and executed synthesis of reserpine. There was a commensurate expansion of pharmacological research, most of it concerned with analyzing the unique combination of properties exhibited by reserpine, as well as revival of interest in the botany and pharmacognosy of the genus.

Obviously the time was ripe for reviewing the various aspects of the field anew in the light of these recent advances. The authors of "Rauwolfia," each of whom has in his area of competence made important contributions to the present state of knowledge, have succeeded admirably in imparting the new look on the topic. The four chapters of the little book are written in the manner of brief review articles. There is no attempt to bring in technical detail, except in the chapters on the botany (R. E. Woodson) and on the pharmacognosy (H. W. Youngken), where much of the space is naturally given over to the description and visualization of morphological subject matter. While the chemist interested in the Rauwolfia alkaloids will rarely have need for this kind of information, he will be well advised to read the initial sections in the botanical chapter which deal with the taxonomy, synonomy, geographical distribution of the species, and their culture and propagation. For instance, it may be new to him that *R. tetraphylla, canescens, heterophylla* and *hirsuta* are not, as he may have been led to believe by the chemical literature, different species, and that according to the nomenclature rules *tetraphylla* deserves preference. Likewise, he may be unaware of the fact that *R. canescens* is not indigenous in India, but was transplanted there a century ago from the West Indies.

The chemical chapter, by E. Schlittler, opens with a very useful set of tables listing the alkaloids so far isolated from the various species, together with their melting points, rotations and references to the papers reporting their discovery. In the following exposition of their structure chemistry some order is brought into the chaos of names by grouping the compounds according to certain structural criteria (anhydronium bases, indoline types, tertiary bases with heterocyclic, or alicyclic, ring E). The numerous more "conventional" representatives (yohimbine types) of the last-named group are treated somewhat cursorily, to allow fuller discussion in the following section of its most important members, reserpine and its two congeners, deserpidine and rescinnamine. That the proof of structure and the elucidation of the stereochemistry of these compounds should have received authoritative and lucid treatment by the originator of this whole line of research was only to be expected. In the stereochemical argument one could perhaps disagree with the author on one or two points in his evaluation of the evidence. Thus, this reviewer was a little surprised to find one of the early proofs for the *cis*-fusion of rings D and E, the formation of a quaternary N-4 tosylate from methyl reserpate 18-tosylate on treatment with collidine, discussed not in this context, but in connection with the configuration of C-17, on which this observation bears only indirectly. The chapter ends with a brief review of the synthetic studies so far on record, including the Woodward synthesis of reserpine, which is conveniently outlined in a flow sheet.

The present status of pharmacological knowledge is ably summarized by J. A. Schneider in the last chapter. It opens with an introductory section dealing with the historical aspects and the effects of crude extracts from various species. The pharmacodynamic properties of the individual alkaloids, grouped for this purpose as in the chemical chapter, are then reviewed. It is, of course, the subsection on reserpine which gives real substance to the chapter. Here the author could draw on a comparative wealth of recently published material which lent itself to classification according to pharmacological criteria and more detailed discussion in terms of specific effects.

In brief, the booklet provides all the essential information on Rauwolfia in highly condensed, yet readable form. It will be equally useful to the expert as a source of references and to the newcomer who needs orientation in one or the other aspect of the field.

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