it is unfortunate that an author who spends so much time in assembling a critically selected bibliography will consent to have its utility diminished by limiting it to unidirectional use.

In spite of these minor flaws, the book will be found to be of great value to all scientists interested in the field, whether from the chemical, biological, or medical point of view or whether they are beginners or experienced in these studies.

Alsoph H. Corwin
Department of Chemistry, The Johns Hopkins University
Baltimore, Maryland 21218

Topics in Phosphorus Chemistry. Volume 1. Edited by M. GRAYSON, American Cyanamid Co., Stamford, Conn., and EDWARD J. GRIFFITH, Monsanto Chemical Co., St. Louis, Mo. Interscience Publishers, John Wiley and Sons, Inc., 605 Third Ave., New York, N. Y. 1964. vii + 262 pp. 16 × 24 cm. Price, $12.00.

This volume is the first of a new series which has been inaugurated "to provide the general scientific reader as well as the specialist in phosphorus chemistry with a series of critical evaluations and reviews of progress" in this rapidly growing division of the chemical science. No pattern of topic coverage has been established for the series and the editorial view is toward a flexible attitude.

A series, such as this one, certainly has a place in the "permanent" chemical literature today. Numerous and rapid strides of research expand the existing knowledge so rapidly that a truly comprehensive piece of writing, even in such a restricted area as phosphorus chemistry, would require at this time a volume of ponderous size, at best. Such a volume would lack a fair amount of the most recent information and, thus, would be out of date, even at the publication date, in several topics if the writer is fortunate.

The present volume contains the following chapters, in addition to the usual author and subject indexes: "Synthesis of Organophosphorus Compounds from Elemental Phosphorus," by M. M. Rauhut; "Nucleophilic Displacement Reactions on Phosphorus Halides and Esters by Grignard and Lithium Reagents," by K. D. Berlin, T. H. Austin, M. Peterson, and M. Nagabhushanam; "The Michaelis–Arbuzov and Related Reactions," by R. G. Harvey and E. R. De Sombre; "Lower Oxo Acids of Phosphorus and Their Salts," by Sh. Ohashi; and "Condensed Phosphates Containing Other Oxo Acid Anions," by Sh. Ohashi.

While the general approach of the individual authors to their chapters varies expectedly in this book, some similarities are clear. The descriptive approach predominates in all of them. This is unavoidable in the last two chapters which deal with very young material, with topics that really did not exist but a few years ago. Probably the best balance between the theoretical and the descriptive approaches is attained in the third chapter on the Arbuzov–Michaelis reaction. This is facilitated, of course, by the relative wealth of data which has appeared in the literature in this connection in the past decade. Unfortunately, this information was made use of much more sparingly by the other authors in this volume. Possibly, at the present time, this reluctance to theorize is wise; however, the time is ripe for a well-founded theoretical analysis of the behavior of phosphorus compounds and a volume such as this one could well be expected to provide a home for such a discussion.

The book is nearly equally divided, space-wise, between the organic and the inorganic phosphorus compounds, so that enthusiasts in both areas would find this volume a useful literature survey up to about mid-1963. The literature coverage from mid-1940's is quite complete, but occasional misses of important points have been found. For example, in the report on the reaction of elemental phosphorus with phenols and alcohols, appearing on pages 12 and 13, the author reports some work by Soviet chemists but for some reason omits the finding that considerable amounts of triphenyl phosphate result from the reaction with phenol. Since this is a commercial product of some considerable importance, this omission would be very hazardous one to an industrial chemical reader.

The make-up of the book is good and attractive. However, in the second chapter the authors make use of heavy Arabic numerals to designate the various compounds that appear throughout the text. This notation is rather hard on the reader who has been brought up on the Roman numerals in such cases. Furthermore, the need for such numerals seems absent in a printed volume of some size, in comparison with the relatively restricted space of a journal article. More generous use of chemical names and formulas would have added but a few lines to the total size of the chapter, but would have added very greatly to the general readability of this chapter.

More generous use of tables of reported compounds, and/or their properties, would have been a most useful addition to this book, particularly for those wishing to make a quick search for a known and recently reported substance. It is to be hoped that such tables will be more frequently employed in the future volumes.

Only a few misprints were found in this volume. One of these is glaringly evident in the second equation on page 7.

While the chapter titles are a clear indication of the contents for the first three chapters, this may not be the case for the last two. These are directed primarily to the inorganic chemistry of the indicated substances and deal with very recent and difficult areas of phosphorus chemistry. The last chapter deals with condensed "polyphosphates" in which links of silicon, sulfur, vanadium, arsenic, calcium, and barium occur.

It is to be hoped that the future volumes will preserve the fine impression given by the first volume of this infant series.

G. M. Kosolapoff
School of Chemistry, Auburn University
Auburn, Alabama

Introduction to Infrared and Raman Spectroscopy. By NORMAN B. COLTHUP, American Cyanamid Company, Stamford, Conn., LAWRENCE H. DALY, State University of New York at Albany, Albany, N. Y., and STEPHEN E. WIBERLEY, Department of Chemistry, Walker Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y. Academic Press, Inc., 11 Fifth Ave., New York, N. Y. 1964. xii + 511 pp. 16 × 23.5 cm. Price, $12.00.

This book was written for the analytical or organic chemist. It aims to provide the reader with an understanding of the molecular basis of infrared and Raman spectra, so that he can make better use of vibrational spectroscopy in his own work. It starts off with three chapters on the elementary physics of molecular spectra, on instrumentation for infrared and Raman spectroscopy, and on molecular symmetry as the basis of the spectroscopic activity of molecular vibrations. This introductory material, which makes up one-third of the book, is intended to provide a background of molecular physics for Chapter 4 on "The Origin of Group Frequencies." Then follow eight chapters on the characteristic frequencies of the most common organic and inorganic functional groups, an excellent chapter, "Major Spectra–Structure Correlations by Spectral Regions," and two entitled "The Theoretical Analysis of Molecules" and "The Calculation of Thermodynamic Functions."

As a bridge covering the gap between Herzberg's formidable monograph "Infrared and Raman Spectra" and Bellamy's comprehensive treatise on the infrared spectra of large molecules, this book serves a useful purpose. For the most part it compares favorably with the half-dozen or more such books which have appeared in English in the past few years.

The best features of the book for its intended readers are contained in Chapters 4–13, summarizing functional group frequencies and their origins. Not only are group frequencies discussed in authoritative detail, but 624 infrared spectra in condensed form are presented to illustrate the appearance of the infrared bands from which these frequencies are derived. The conditions under which the various spectra were obtained are carefully stated and the spectra are well indexed both as to functional groups and as to molecular formulas.

This reviewer's chief criticism would be directed at Chapter 3, entitled (somewhat inaccurately) "Classification of Molecules." It seems of doubtful value to try to present the mathematical theory of group representations in a few pages to the organic or analytical chemist if the chief objective of the presentation is to show him how to calculate the number of molecular vibrations belonging to each symmetry species. This calculation can be explained in simple terms without explicit appeal to group theory, and generalized in the form of tables, as has been shown for example by Herzberg (*loc. cit.*, pp. 131–135). The latter approach is no less exact than the group-theoretical procedure, to which it is entirely equivalent, but with proper exposition (such as that of Herzberg, for example) it gives the beginner more insight into the form of vibrational modes.

The discussion of the physical basis of infrared and Raman selection rules in Sections 3.7 and 3.8 is also needlessly obscure because of its burial under group theoretical formulas which are taken from the literature without explanation. This discussion in particular is at odds with the claims in the Preface that "the theory presented

in this text is on an elementary level and no attempt has been made to cover any involved or sophisticated aspects" and "Care has been exercised in eliminating the time-honored 'it readily follows that' mathematical approach which leaves the student in a puzzled quandary."

The book seems to be relatively error free, but Table 3.8, which gives "chemical examples of important point groups" and extends over 34 pages, contains numerous examples which are misleading or incorrectly assigned, such as the assignment of "*p*-$FC_6H_4CH_3$" to the point group D_{2h}, "NH_4Br" to D_{4h}, "$(C_6H_5)SnCl_3$" to C_{3v}, and so on. Finally the reviewer would like to record his sorrow at finding, in a publication intended for the use of students, that the expression "asymmetric vibration" is used regularly instead of the correct term "antisymmetric vibration". That the authors should know better is illustrated by their description of the normal vibrations of the water molecule in the caption to Figure 3.7 and by their correct usage of the term in the text relating to that figure.

Richard C. Lord

Department of Chemistry and Spectroscopy Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

Steroid Drugs. Volume II. Index of Biologically Active Steroids. By NORMAN APPLEZWEIG, Director, Norman Applezweig Associates, Consulting Biochemists. Holden-Day, Inc., 728 Montgomery St., San Francisco, Calif. 1964. ix + 449 pp. 19.5 × 26.5 cm. Price, $10.50.

"This volume attempts to carry forward the coding of biologically active steroids that was started in *Steroid Drugs*, Norman Applezweig (McGraw-Hill, New York, 1962)." Thus the first sentence of the Introduction in Volume II. It is an effort to summarize journal and patent literature on steroids which makes any mention of biological activity. In the 449 pages of this book (a) 13 are devoted to the explanation of the steroid nomenclature, the classification of the biological activites, and a listing (not an explanation) of twenty-one categories of activities; (b) 91 contain tables of biologically active steroids; (c) 430 catalog structural formulas, patent or literature references, and major probable or claimed activity; and (d) 9 list steroid drugs available commercially or for investigative purposes.

This is, therefore, not strictly a book about the 1594 steroids classified but a catalog. Since it lacks an index, the user must seek out for himself any compound or group of compounds by rather particular means. Knowing the type of biological activity he is seeking, ready access to minimum information is available. Indeed, for the major activity categories the author attempts a tabulation of relative biological potencies, *i.e.*, androgenic, estrogenic, progestogenic, and corticoid, on the basis of one or more standard assay procedures. This attempt is not a particularly happy one because variations in assay procedures in different laboratories make over-all comparisons rather unreliable. Indeed, it appears that the author reneged on his intentions in this regard since the table on progestogens lists six columns of tests with some potency figures for the first three but none for the last three; in his listing of tests at the head of the table test 6 is not even described. Similarly, there are six columns in his table of corticoid activity, but the sixth is both blank and unexplained. The listing of relative estrogenic activities is so slight as to be unmeaning.

It is, therefore, the table cataloging of biologically active steroids with its references to literature which is the primary source matter of this volume. Here, despite certain minor irritant headings (*e.g.*, the use of the meaningless activity "antihormonal," the misspelling of lipiodiatic as lipiodiactic, the inclusion of subnumbers not too understandable—such as 2359 A, B, and C), the industrious searcher may indeed glean adequate references and information on chemical structure. This catalog cannot be entirely systematic in its listing of compounds, but it attempts a fairly logical sequence beginning with estrogens and other 18-carbon steroids and their relatives and derivatives, proceeding to androstane derivatives, thence to pregnane derivatives. This is only mildly helpful in the search for a particular compound or its homologs and analogs. Most of the references are to specific patents which the author acknowledgedly finds not too meaningful in their allegations of biological activities. The journal literature citations are limited and are, interestingly, listed (like the patent references) under the name of the drug house whence the compound originated. The catalog therefore appears primarily designed for use by the steroid industry rather than by the steroid biologist. It is, nonetheless, a useful guide to the present maze of steroid literature, involving a praiseworthy attempt at systematization on the basis of biological activity, a clear adherence to accepted chemical nomenclature, and a much-needed systematic tabulation of compounds.

Gregory Pincus

Worcester Foundation for Experimental Biology
Shrewsbury, Massachusetts

Comprehensive Analytical Chemistry. Volume IIA. Electrical Methods. Edited by CECIL L. WILSON and DAVID W. WILSON in association with C. R. N. STROUTS. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York 17, N. Y. 1964. xvi + 268 pp. 16 × 23.5 cm. Price, $11.00.

The first volume of this well-known and highly regarded series dealt with classical methods of analysis and appeared in three parts, each of about 700 pages. This much slimmer book is the first of two that are planned to cover electrical methods of analysis. In their preface the editors attribute this division to a desire to "minimize delays in publication due to inevitable hazards in the preparation of individual chapters." No one who has been associated with the preparation of a collective volume can fail to recognize the force of this consideration. It means, however, that this review of half a book can be only an interim report and not a definitive description of the editors' aims and the contributors' success in attaining them.

There are five chapters. In the first, which is a very brief introduction by Arthur J. Lindsey, electrical methods are divided into seven classes: electrolytic, potentiometric, amperometric, coulometric, conductometric, impedimetric ("high-frequency conductometric"), and polarographic. It is apparently intended to deal with the first, second, fifth, and sixth of these in the remainder of the volume, and to describe amperometric, coulometric, and polarographic methods in its successor. The second chapter, also by Lindsey, deals with electrodeposition in 55 pages of text with 111 references, and includes constant-current and controlled-potential techniques, internal electrolysis, and electrographic analysis. The third and fourth chapters, by Donald G. Davis, cover potentiometric titrations (in 101 pages with 422 references) and conductometric titrations (in 38 pages with 138 references), respectively. The fifth, by T. S. Burkhalter, deals with impedimetric titrations in 36 pages with 44 references, 42 of which are also included in a general bibliography of 188 items. The index, in 14 pages, is very good as regards the text, of which only a very few items have escaped inclusion, but it does not include the contents of several extensive tables.

The book is directed toward the practical analyst: according to its editors, its aim is "to provide a working manual." It includes descriptions of the apparatus needed for different kinds of electrochemical analyses, brief summaries of those portions of the theory that are most indispensable in practical determinations, and rather detailed summaries of procedures that have been proposed for determining many inorganic and some organic substances.

This is useful and important information, and it may be said at once that every practical analyst who ever has occasion to use or consider any of the techniques included here will find this book extremely valuable. Davis' two chapters are especially noteworthy: that on potentiometric tirations is the best summary of its topic that has appeared since the book by Kolthoff and Furman.

One cause for regret is that the contributors were not assigned rather broader topics than appears to have been the case; Lindsey's classification in Chapter I promises more than the subsequent chapters include. Thus Lindsey speaks of "potentiometry" but Davis was nonetheless apparently asked to write on potentiometric titrations. This chapter does not mention precision null-point potentiometry or any other application of direct potentiometry save in the measurement of pH; the pM electrode of Reilley, *et al.*, is mentioned because it has been used in potentiometric titrations, but metal-ion-responsive glass and membrane electrodes are not. By the same token, what Lindsey calls "impedimetry" is represented by a chapter whose title includes only its use in titrations; direct impedimetry is mentioned in passing, but in keeping with the title of the chapter there is no mention of its use for analyzing binary mixtures.

Every silver lining has a cloud, and the emphasis on practical application here has sometimes led to more condensation and simplification of the theoretical discussions than might have been de-