

Book Reviews

SEMIMICRO EXPERIMENTS IN GENERAL CHEMISTRY AND QUALITATIVE ANALYSIS. By NICHOLAS D. CHERONIS and HERMAN STEIN. Pp. x + 310. New York: John de Graff, Inc. 1959. Price \$4.00.

This is essentially a manual of practical work in general elementary chemistry, the semi-micro technique being used throughout, and is the result of eight years' experience of teaching a one-year course in an American college. Divided into two parts, it contains in all 38 chapters, each of which is prefaced by a background discussion of the theory underlying the experiments described in it.

The first part is divided into 30 chapters, with a total of 115 exercises ranging from the usual gas preparations to a refreshingly large number of experiments in physical chemistry. This section also includes chapters on organic chemistry. The second part, 8 chapters, is devoted to inorganic qualitative analysis along more or less traditional lines, with an introduction to paper chromatography and ion exchange.

Chemistry teachers in the grammar schools of this country have generally accepted the use of small-scale methods for practical work in qualitative analysis and organic preparations, but, with few exceptions, they have not extended the technique to the whole field of practical work in general chemistry; this manual shows well the possibilities of extension. The apparatus used is that familiarly associated with the technique as practised in this country, but some of the experiments described and reagents used would be thought outside the range circumscribed by the usual school syllabuses. There is a dearth of preparations of typical inorganic compounds. In the chapters dealing with organic chemistry, few of the traditional preparations are described, but a broader, more realistic approach is preferred, including an elementary study of fats, proteins, polymers, etc. This approach will not be acceptable to the traditionalist, but may well be the shape of things to come in future "O-level" work.

The second part, dealing with qualitative analysis, has little to commend it for use in this country, as most of the teaching here is tied to the requirements of the "A-level" examinations. The treatment of a few of the less familiar elements in the scheme is poor and would be better omitted.

The book is well printed, but the format, with its perforated pages, would soon present an untidy appearance under normal school conditions. The use of chapter and section references instead of pages is most irritating as well as time-consuming.

This manual should find a place on the shelves of the more progressive teachers in grammar schools, for there are many ideas in it for making the practical work more versatile and less time-consuming than at present.

H. HOLNESS

LES RÉACTIONS ÉLECTROCHIMIQUES. By G. CHARLOT, Mme. J. BADOZ-LAMBLING and B. TRÉMIL-LON. Pp. viii + 398. Paris: Masson et Cie. 1959. Price (paper) 6000 fr.; (cloth boards) 6800 fr.

Any work on this subject from this school will be received with interest by all analytical chemists concerned with electrode processes and electrochemical methods of analysis. The series of papers on the interpretation and application of polarisation curves that has appeared during the past few years has undoubtedly whetted appetites for the comprehensive exposition that comprises the first part of this book. A praiseworthy attempt is made to devise a unified approach to electrochemical problems from a novel angle, a provocative and stimulating angle, which will repay the study required for its understanding by bringing new ideas and a fresh appreciation of many different aspects of the subject. The concise, almost terse, style renders digestion a little difficult, but is complementary to the lucidity of the treatment. Perhaps we may hope for a translation following that of Professor Charlot's "Quantitative Inorganic Analysis," which would be of much assistance to English-speaking peoples. The treatment is essentially experimental; no attempt is made to cover the thermodynamics or reaction mechanisms dealt with in theoretical electrochemical texts, nor is any attention directed to industrial electrochemistry and its special problems. This in itself is a welcome feature to practising analytical chemists, who seek to understand the systems with which they are particularly concerned. The method of determining

current - voltage curves is described, their qualitative significance and application to fast and slow reactions are discussed, the influence of physical factors is considered, and then a survey of electrochemical methods of analysis is given. This covers potentiometry, amperometry, coulometry, and recent developments in chronoelectrometry and polarography and finishes with a review of work in fused salts and non-aqueous media. One is left rather breathless after all this, but the treatment is compendious rather than superficial, and the references are full. There are omissions, some of which may be repaired in future editions, but this is to be expected in a work of this nature; and there are matters that could be hotly debated, but this is to the good. It is understood that this work has been well received on the Continent, and it certainly merits close attention from all working or teaching in this field. The printing leaves a little to be desired, especially in the smallest type-faces, but the indexes and general production are good. The price is unfortunate, but perhaps inevitable, yet it may cause many to wait for a translation, possibly with some revision or expansion, for this is a living subject and still young.

E. BISHOP

AUTOMATIC TITRATORS. By J. P. PHILLIPS. Pp. viii + 225. New York and London: Academic Press Inc. 1959. Price \$6.00; 48s.

There is no doubt that during the past few years there has been a distinct tendency to introduce automatic titration equipment into analytical laboratories.

In some instances, this apparatus has permitted analysts to take samples and to titrate them with appropriate reagents to pre-set end-points, often making use of anticipatory devices that slow down the titration just before the end-point. In others, it has been possible to carry out full-scale titrations on batch samples. Moreover, under suitable conditions, it is possible to withdraw a liquid sample from a plant stream, to titrate this sample to a pre-set end-point and to repeat this cycle of operations at appropriate intervals of time.

With all these changes taking place, the appearance of this book on "Automatic Titrators" is indeed timely.

It should be emphasised at once that the book is a very good one and very well written. It contains a surprisingly large amount of up-to-date information on automatic titrations. After a preliminary introduction, the author outlines some general considerations of titrator design. He then discusses successively the various forms of automatic titration, *i.e.*, potentiometric, amperometric, dead-stop, conductimetric, photometric, thermometric and coulometric, and the appropriate equipment for these tests. Titration curves in their original forms and the first, second and even third derivatives of such curves are dealt with.

Fully automatic and continuous titrations are discussed, and there are final chapters on commercially available titrators and on the applications of automatic-titration methods. There are excellent sets of up-to-date references at the end of each chapter.

Although Phillips is obviously an enthusiast, he approaches his subject with a "down-to-earth" attitude that enables him to make some very shrewd observations on the extravagant claims sometimes put forward by makers of automatic-titration equipment.

Analytical chemists who are already using automatic titrators will be well advised to read this book carefully, because it is brim-full of ideas, some of which they are bound to incorporate in subsequent work.

Even those who still cling to manual forms of titration with colorimetric end-point indicators might usefully try to avoid being too embarrassed by such terms as "thyratrons" and "resistance capacitance networks" and spare some time for studying the wider implications of this rather revolutionary approach to titration work. They, as experienced analysts, will be able to ask the right questions about these new procedures, *i.e.*, questions about the accuracy, reproducibility and standardisation of such tests. They will want to know, for example, whether the coulomb will be a satisfactory standard in many coulometric tests or whether, after all, performance against a known chemical will be the real arbiter.

J. HASLAM

ION EXCHANGE RESINS. Fourth Edition. Pp. iv + 68. Poole, Dorset: The British Drug Houses Ltd.

The fourth edition of this booklet provides very useful information about the Permutit and Amberlite series of ion-exchange resins now available. Some of the resins can be purchased as general grades, and others are available as "Analytical grades" and "Chromatographic grades."

Detailed information is given about each resin, *i.e.*, about its chemical nature, particle size, density and capacity as an anion or cation exchanger. The precautions that must be taken in the regeneration of the spent resin are described, as well as the effects of temperature, oxidising and reducing agents and strong acids and alkalis on the resins.

A special chapter is included on the newer ion-exchange membranes, and there is an excellent description of the use of the various ion-exchange resins in analytical work and in other miscellaneous applications.

In a future edition, it might be useful to give more information about the chemical structures of these ion-exchange resins, whether cross-linked or not. Further, the chapter on recommended applications for specific resins could be expanded considerably; it is not particularly satisfactory to know that information about, *e.g.*, the treatment of sugar solutions by a particular ion-exchange resin, may be found in manufacturer's literature. Incidentally, there has been some jumbling of the figures in Fig. 3, p. 38.

The references to books, reviews and original papers are comprehensive, and the booklet can be heartily recommended to analytical chemists.

J. HASLAM

RADIOACTIVE TRACERS IN CHEMISTRY AND INDUSTRY. By PASCALINE DAUDEL. With a foreword by IRÈNE JOLIOT-CURIE. Translated by ULLI EISNER, Ph.D., D.I.C. Pp. xii + 210. London: Charles Griffin & Co. Ltd. 1960. Price 36s.

This little book by a distinguished French author is a translation, with some additions and revision, of a French text published in 1955, at 800 francs. Its main purpose is to classify the many ways of using radioactive tracers, and this it does well by choosing examples of each type from published work. There are five chapters and two appendices—

- (1) Radioactive tracers—general principles.
- (2) Application of tracer techniques to the study of reaction mechanisms.
- (3) Exchange reactions.
- (4) The use of tracer techniques in chemical analysis.
- (5) Radioactive tracers in industry.

Appendix 1. Table of the principal radioactive isotopes (4 pages).

Appendix 2. Experimental procedures (11 pages).

The chapter on tracer techniques in chemical analysis is the longest (50 pages) and provides a useful introduction for readers who are not familiar with the subject.

But, apart from the classification of the different uses of tracers, little of the "expertise" of the author is apparent, and the book is one to be read by the non-specialist as an introductory text, but it is not likely to find a permanent place on his bookshelves.

A. A. SMALES

A STATISTICAL MANUAL FOR CHEMISTS. By EDWARD L. BAUER. Pp. x + 156. New York and London: Academic Press Inc. 1960. Price \$4.75; 38s.

Statistics made its first incursion into analytical chemistry with "Student" some fifty years ago, but it is only within the last decade or so that it has become a general tool for the analyst using chemical methods, although it has been an essential element in biological analytical methods for more than twenty years.

The present volume is written by a chemist and does not purport to be more than the title signifies—a manual that states what the chemist needs to know about his results and how to get that information without considerations of the ratiocination leading thereto. In this respect it is a lucid exposition based on numerical illustration and capable of being followed by any assistant of G.C.E. level.

The volume differs from most elementary books on statistics in that the variance and standard deviation are derived throughout from the range of replicate results, apart from one illustration of the method of squares of deviations from the mean. This has the advantage of eliminating those tedious sums of squares, but calls for special tables, which are provided in the appendixes.

The subjects dealt with include experimental design, analysis of variance (introducing a new portmanteau word, ANOVA, which at first sight suggests either nutritional or endocrine associations, at least to a biochemist), comparisons of means, correlation and regression with reference to colorimetric analysis, sampling and routine control. The whole of the ordinary work of the analyst in a chemical laboratory is therefore covered.

The book is well produced, but contains a number of misprints, which, while offering no difficulty to one familiar with statistics, may prove great puzzles to the person for whom the book is primarily designed. Thus, on p. 18, the 95 and 99 per cent. confidence limits are worked out to be the same, but the resultant variation in individuals is correctly expressed. Again, on p. 24, Table 2, the comparison column gives a measure of the mean effects P, T and C, not C, P and T.

The book begins, as every book on statistics should in the absence of an international convention of symbols, with a glossary of symbols used, but some confusion occurs in the treatment of analyses of variance from the use of the same symbol to denote at times the true mean (*i.e.*, the mean divested of errors) and at others the grand mean, *i.e.*, the observed mean of all experiments.

In such complicated typesetting as treatises on statistics demand, such errors as have been mentioned are easily missed in first printings and can readily be remedied later. Within its limitations as a manual primarily for the man at the bench, the book is clearly written and serves a useful purpose, but the price of 38s. for such a slender volume of 156 pages is not likely to encourage sales.

J. I. M. JONES

AN INTRODUCTION TO CHEMICAL NOMENCLATURE. By R. S. CAHN, M.A., Phil. nat., F.R.I.C. Pp. viii + 96. London: Butterworths Scientific Publications. 1959. Price 10s. 6d.

In the relatively short period since the publication of Dr. Mitchell's book, there have been many changes in British chemical nomenclature. To mention but a few, there are the alphabetical order for substituents, etc., the Anglo-American agreed naming of compounds containing one phosphorus atom and the rules for the nomenclature of steroids; these are surely if slowly gaining ground, the last despite the Fiesers. Evidently there is more to come, for the Editor to the Chemical Society observes that the time is not yet ripe for a complete text-book of nomenclature.

On the inorganic side, the IUPAC Nomenclature of 1957 has been adopted extensively, though not quite in its entirety. Here are a few points: the symbol Ar represents argon; there is a lengthy but limited list of trivial names for acids; the prefix "peroxo" is used for acids formerly denoted as "peroxy" or simply "per"; the endings -ous and -ic for salts, though not recommended, may be retained when no more than two valencies are involved, with the hope that they will ultimately vie with old soldiers; $\text{Li}(\text{AlH}_4)$ is lithium tetrahydridoaluminate. Among the divergencies are the retention of tungstate for wolframate and nickelate for niccolate; sodium hydrogen-carbonate is written as three words; HIO_4 remains as periodic acid, with H_5IO_6 distinguished as orthoperiodic acid, whereas IUPAC names the former as tetroxiodic (VII) acid and the latter periodic or orthoperiodic acid. It should be added that many simple familiar names are retained.

Most organic compounds can be, and often are, named in different ways, quite apart from any trivial names that may exist. The first recipe now is relatively straightforward; first catch your principal functional group, set it in position in the parent compound, give it the lowest available number and finally add the other substituents as prefixes in alphabetical order. From the above, it follows that the parent compound is not necessarily the largest recognisable unit; numbering may be predetermined by other factors, *e.g.*, that peculiar to the parent compound. The concept of "functional groups" is one that has crept unheralded into British usage; without going into detail here, for practical purposes they are those that can be designated by suffixes. There is an order of seniority for such groups that permits the principal one to be selected. However, as in the culinary field, the recipe is not always as simple as it seems. For example, there are occasions when a compound contains principal groups attached both to a chain and to a ring system, and the selection may then become a matter of personal opinion.

For polycyclic hydrocarbons and heterocyclic compounds the IUPAC 1957 Rules, themselves following the Ring Index system, are adopted with one small difference. The recently introduced use of commas instead of colons to separate numerals is extended by example to bicyclo-hydrocarbons, whereas the other authorities employ full stops.

Attention is drawn to the distinction between substitutive nomenclature, *e.g.*, 2-naphthylacetic acid, and conjunctive nomenclature, *e.g.*, naphthalene-2-acetic acid. The former is generally preferred here, while the latter, adopted mainly for indexing purposes, is widely used in America, and it must be admitted that it has advantages for naming compounds of the EDTA series.

The author states that organic chemical nomenclature is an infuriating subject. The present book will not meet every case—after all, it is only intended as an "Introduction"—but it should serve to moderate the fury without involving undue labour; the occasional light touch helps.

A few rather obvious errors are concentrated on p. 81.

B. A. ELLIS

THE PHARMACEUTICAL POCKET BOOK. Seventeenth Edition. Pp. xii + 576. London: The Pharmaceutical Press. 1960. Price 30s.

The first edition of this book was published in 1906 and was intended as a guide for students of pharmacy. In later editions the scope was widened and information of value to the practising pharmacist included. The present edition contains about 150 more pages than the preceding one, published in 1953, and embodies information of value to those analysts who may be concerned with the examination of pharmaceutical products.

A particularly good feature, new to this edition, is the Table of Solubilities extending over 31 closely printed pages and giving values for six solvents. The summary of the legislation connected with pharmacy and the sale and handling of drugs is comprehensive, up-to-date and of real value to all who are associated with pharmaceutical business. The article on Isotonic Solutions has been extended to nearly twice the length of its counterpart in the sixteenth edition, and there is a substantial table of values. Also revised is the section on Biochemical Analysis, which, however, is not intended as more than a summary for the assistance of students.

The 32 pages listing proprietary names of drugs, with their corresponding approved names, will help to clarify some of the confusion promoted by the multiplicity of names so often given to modern remedies.

The above are only a few of the many valuable features contained in this well bound and modestly priced volume published under the auspices of the Council of the Pharmaceutical Society of Great Britain and revised by the Staff of the Department of Pharmaceutical Sciences.

NOEL L. ALLPORT

L'ANALYSE CHIMIQUE ET PHYSICO-CHIMIQUE DE L'EAU: EAUX NATURELLES; EAUX USÉES. By J. RODIER. Second Edition. Pp. xiv + 358. Paris: Dunod. 1960. Price NF 48.

This useful and up-to-date volume is a complete revision of a practical handbook first published in 1950. The emphasis is chiefly on the analysis of natural waters, but considerable space is devoted to polluted waters. Short bibliographies are included in each chapter. Practical details are given for the more important physico-chemical determinations: density, pH, rH, electrical conductivity, temperature, turbidity, colour and suspended matter. The topical character of the book is well illustrated by the inclusion of methods for determining radium, radon, and α -, β - and γ -radioactivity in waters. Chemical tests include those for acidity, alkalinity, hardness and gaseous constituents; the various forms of nitrogen and sulphur; the commoner cations (Ba, Ca, Sr, Li, Mg, K, Na, Sb, Cd, Cr, Co, Hg, Pb, Cu, Al, Fe, Mn, Zn and U); anions (F, Cl, Br, I, borate, silicate, cyanide, phosphate and polyphosphates); also As, Se, V and phenols. Short notes are included on the interpretation of the analytical results.

For polluted waters, details are given for the determination of B.O.D., permanganate value and synthetic detergents, and two putrescibility tests are described. Methods for controlling the sterilisation of water are also included.

There is little to criticise in this valuable book. English readers may find the expression "mg %₀₀" a little puzzling without some explanation. In the account of the B.O.D. test, no mention is made of the use of a mineralised water for dilution purposes. Other notable omissions are tests for nickel and tin (found in plating wastes), titanium (paper-mill wastes), silver (plating and photographic wastes) and ferrous iron (mine waters and pickle liquors).

Dr. Rodier's book is well printed and bound and can be warmly recommended to all workers in the field indicated by the title.

L. KLEIN