

## Book Reviews

A LABORATORY HANDBOOK OF PULP AND PAPER MANUFACTURE, INCORPORATING THE FOURTH EDITION OF STEVEN'S "PAPER MILL CHEMIST." By JULIUS GRANT, M.Sc., Ph.D., F.R.I.C. Second Edition. Pp. viii + 523. London: Edward Arnold (Publishers) Ltd. 1961. Price 80s.

When Dr. Grant reviews and reports, we have come to expect a clear presentation of the facts given in an easily readable and understandable form. His mastery of this technique is clearly illustrated in his book, particularly in his handling of complex and difficult subjects such as packaging, plastics, toxicity evaluation and statistics.

The author's aim in preparing the second edition of his book is covered in the preface. Seven-teen years have elapsed between the first and second editions, and it is agreed that this period of time has been "momentous" for the pulp and paper industry. To quote: "These advances have, of course, had wide repercussions in the subject matter of this book." There are 78 additions to the text, many being only a few sentences or paragraphs. The main additions come under the headings of printability, packaging, plastics, statistics, water and effluents. After studying the book it is difficult to appreciate how recent advances have radically changed the useful contents of the laboratory handbook. Laboratory work in the main has changed little and the majority of tests are well covered in the first edition.

Some justification for the remarks can be found in the highly specialised field of laboratory work. The paper mill chemist cannot hope to continue to be fully informed on all aspects of specialised investigation and testing. Some applications are of limited interest to him and the equipment necessary is often expensive and not always available. The techniques can, for certain applications, be of great value and coverage of these subjects does allow critical assessments to be made.

The section on electron microscopy is an example. An electron microscope must continue to be a curiosity for most chemists, but its possibilities and limitations are particularly important when all members of the Research Association are in a position to have any problem examined by this technique. The question of toxicity is in a similar category and the book gives an understanding of the testing methods and also a means of interpreting the results quoted.

The expanded statistics section gives a clear explanation of the mathematical techniques and their applications. It is certainly broad enough in scope, without being complicated, to allow the use of statistical methods in both laboratory testing and certain machine applications.

Recent legislation is demanding continual improvement of paper-mill effluents. The section on this subject is particularly valuable. It covers most of the important points and gives all the necessary background for the start of investigational work. The criticisms of the B.O.D. tests are fully justified.

Esparto cooking in Britain is shrinking and there seems little justification for introducing details on the composition of esparto wax extractable during the cleaning process. Similarly, expansion of the section on rag treatment appears to be unnecessary. However, with the advent of greater competition from the Scandinavian countries the treatment of waste paper becomes of increasing importance and the additions to this section are welcomed.

As a pulp importing country Britain must obtain maximum value for money and the increased emphasis on pulp evaluation is essential. Difficulties encountered by every paper mill in this field are illustrated by the section on sampling pulp for moisture content. It is regrettable that, although the coverage is admirable, there is little new information to help the sorely tried mill chemist who has to decide whether to risk submitting a pulp consignment to arbitration in the event of discrepancies.

Laboratory beating techniques in connection with pulp evaluation are important and it is admitted that for some pulps the Lampén mill method of beating is not reliable. No better alternative, however, is suggested.

Methods used for determinations of fibre length are often based on personal preference, but screening now seems to be almost completely superseded by fibre measuring and counting. It is difficult to understand why it is considered necessary to describe a screening method. Microscopical methods are critically reviewed and the clearer way of presenting the "weight factor" table of some common papermaking fibres should be helpful.

Testing of clays is a difficult task, their properties often being influenced by pH. The testing method covered does not include this point.

The information given on the evaluation and testing of retention aids and optical bleaching agents is sketchy and inadequate in view of the increased importance and use of both these items.

The need for accurate measurement of consistency on the paper machine is now urgent. Because of increasing production speeds and emphasis on controlling quality the more important aspects of this measurement are continuous indication of consistency and also its control. Unfortunately, these items have not been covered. These production trends also mean that more attention must be paid to keeping production units in good condition. The recommended method of measuring pressure between calender bowls is an important contribution.

The use of synthetic fibres for paper machine felts is now accepted and the present position is admirably summarised. However, Dr. Grant states that felts containing synthetic fibres tend to "blind" more readily than wool and mark the paper to a greater degree. From numerous

enquiries from papermakers using felts containing synthetic fibres it would appear that these views are not generally accepted.

Tub sizing as described is seldom used and any newcomer to the industry will find it disturbing to learn that there is no index reference to "sizepress." The unit is referred to only in passing and in view of its ever increasing use is worthy of greater description.

Other items that would appear to be worthy of inclusion in a laboratory handbook are: rheological measurement in connection with coating mixes particularly in view of the increasing number of on-machine installations, beta-ray gauges for determination of substance both on the machine and in the laboratory, and the use of the xenon lamp as a light source for the evaluation of light fastness.

The staining techniques for the identification of fibres and cooking methods are important. Different chemical treatments are now used on one type of wood and it is no longer valid to conclude that a certain treatment has been given to the fibre because of the latter's cellular structure. The lack of advance in this field is illustrated by the fact that only one new stain has been added to the list given in the first edition.

On the subject of physical testing, reference is made to the Van der Korput tensile tester as a dynamic instrument. However, it should be stated that the instrument can also be used for measuring static tensile and stretch.

A few lines are devoted to the testing for silicones, but anyone who has attempted to establish their presence will realise that such an exercise is not easy. The remarks do not in any way indicate the difficulties involved.

The first publication of this book had to conform to the War Economy Standard and the lifting of this restriction on paper usage has resulted in a clearer, more easily read text, better spacing and superior reproductions of drawings and photographs. The use of a glossy paper, however, can be most annoying especially when reading in a position illuminated from a number of different sources. Further, this book will often be opened and used on a laboratory bench. Any liquid accidentally splashed on to the pages will result in a dull stain. If the book is closed while the page is still damp with water the effect will be sticking of one page to another.

Mill chemists are notorious at obtaining the wrong answer when using rapid methods of calculation. To avoid the possibility of some future annoyance to a mill manager or papermaker it should be pointed out that the machine production formula on p. 230 should include substance in lbs D.C. 480's (compare Table 37, p. 503).

J. B. HEATON

**AN INTRODUCTION TO INFRARED SPECTROSCOPY.** By Dr. WERNER BRÜGEL. Translated from the German original by A. R. KATRITZKY and A. J. D. KATRITZKY. Pp. xvi + 419. London: Methuen & Co. Ltd., New York: John Wiley & Sons Inc. 1962. Price 55s.

The development of analytical chemistry during the last 20 years has been characterised by the introduction and general acceptance of a wide range of physical methods that have helped solve problems, which either could not have been undertaken or would have taken much longer to solve by the older chemical procedures. Infrared-absorption spectroscopy is a leader among the newer techniques and is one of the most powerful tools available to-day for the rapid identification and measurement of an organic compound. Infrared spectroscopy is, however, a rapidly expanding subject and it is difficult for a student to gain a comprehensive picture of both the theoretical and practical aspects of the subject. An authoritative book that provides an up-to-date account in English of all aspects of infrared spectroscopy is therefore assured of a welcome. This volume, which sets out to meet these requirements, is largely a translation of the second German edition (1957) of Dr. W. Brügel's well known "*Einführung in die Ultrarotspektroskopie*"; some new material and about 70 additional references have been included.

The volume is divided into four main sections, which deal in turn with (1) basic theory, including an account of rotation-vibration spectra of small molecules in the gaseous state, (2) instrumentation and experimental techniques, covering radiation sources and detectors, monochromators and gas analysers, and describing the principal features of modern American, British and German commercial infrared spectrophotometers, (3) practical applications in structural diagnosis and quantitative analysis, and the uses of polarisation, reflection and microscope techniques in infrared spectroscopy and (4) special applications, including absorption-band frequency correlations for the commoner functional groups, the examination of polymers and inorganic compounds, and special effects, such as hydrogen bonding and rotational isomerisation. This

book covers a much wider field than, but is in many ways complementary to, L. J. Bellamy's monograph ("The Infrared Spectra of Complex Molecules," Methuen & Co. Ltd., London, Second Edition, 1958); the latter ignores the theoretical and instrumental aspects of infrared spectroscopy, but provides a more detailed account of structural correlations. Dr. Brügel's book disappoints in having relatively few references to work published since 1957; recent work on aromatic and heterocyclic compounds, a field in which Dr. A. R. Katritzky, one of the translators, has had special experience, is adequately reviewed.

The translation has been well done and the book can be recommended to all students and to chemists who require a reliable account of both the theory and the practical applications of infrared spectroscopy. The volume is well produced and has few printing errors. It is, perhaps, to be regretted that in his introduction, the author mentions the pioneering work on infrared spectroscopy conducted in Germany and America, but does not refer to the equally important work undertaken in this country.

J. E. PAGE

THE CHROMATOGRAPHY OF STEROIDS. By I. E. BUSH, M.A., Ph.D., M.B., B.Ch. Pp. xxii + 437. Oxford, London, New York and Paris: Pergamon Press Ltd. 1961. Price 80s.

Although the chromatography of steroids has been the subject of many books and reviews in recent years, never has theory been so successfully blended with practice as in the present volume. The shortcomings of an approach to this field not soundly based on theory are lucidly exposed by Professor Bush. In spite of dealing with a rapidly expanding subject this book will prove invaluable both as a reference work and laboratory manual and will undoubtedly remain so for a long time.

However, the scope is limited in that examples are not drawn from bile acids, sapogenins, cardiac aglycones and steroid alkaloids, although the author states justifiably that the general principles he emphasises throughout should be applicable to the investigation of these less familiar steroids. Discussion of partition chromatography, especially on paper, occupies considerably more space than that of adsorption chromatography. Even so the latter is adequately covered considering it is less often used and its basic theory not well developed. One might have expected mention of chromatography on impregnated glass-fibre sheets, a not too recent development offering some unique advantages.

The basic theory of partition chromatography is discussed at length. Numerous examples are drawn from many branches of biochemistry to show that chromatographic behaviour is a consequence of general laws and can be treated on a quantitative basis. The application of these general principles to the chromatography of steroids is illustrated and discussed with reference to the types of systems in use. Discussion of factors influencing chromatographic behaviour, such as chemical structure and solvent - steroid interaction, is more than adequate and to the point.

The author has drawn on his own considerable experience in describing with a wealth of detail the apparatus used and the many techniques involved in obtaining the best results from chromatography. The methods of estimation of steroids by direct automatic scanning of paper chromatograms after treatment with suitable reagents are described at great length on the justification that they are more rapid and convenient than conventional colorimetric procedures and yet almost as accurate. The ever increasing use of double-isotope labelling methods is only described briefly being, in the author's opinion, unnecessary. This may sometimes be so, but the availability of steroids and reagents with high specific radioactivities minimises many of the extra complications while increasing the precision and time and labour saved.

The chapter outlining procedures for structure determination of unknown steroids utilising chromatography combined with modifying steps is excellent, as is that dealing with the application of these techniques to typical analytical problems such as the isolation and estimation of cortisol in blood or aldosterone in urine. The comprehensive appendices include purification of solvents and reagents, details of microchemical reactions for steroids, detection of steroids on paper chromatograms and many others even including the cleaning of glassware.

As in many first editions some misprints have escaped correction in the proof reading. Thus the year of a reference quoted in the text does not always correspond with that given in the reference list and there is a strange omission of both legend and title from the figure on p. 187. However, these are minor flaws in an otherwise outstanding and thoroughly recommendable book.

DENNIS A. SHAW

ADVANCES IN SPECTROSCOPY. Edited by H. W. THOMPSON, C.B.E., F.R.S. Volume II. Pp. xii + 483. New York and London: Interscience Publishers Inc. 1961. Price \$13.00; 98s.

Authoritative monographs on nine topics in spectroscopy form the subject matter of the second volume of this series, of which the first has already received notice in this journal (*Analyst*, 1960, 85, 532). The high standard set in the earlier volume is well maintained; a broad range of interests is catered for by those phases of the subject that now receive attention, as will be appreciated from a list of the contents.

Application of atomic-absorption spectroscopy to chemical analysis (A. Walsh); Spectra of flames (A. G. Gaydon); X-ray spectroscopy (H. Friedman); Nuclear-magnetic resonance (R. E. Richards); Infra-red spectra of crystals (W. Vedder and D. F. Hornig); Refraction of gases in the infra-red (J. H. Jaffe); Infra-red spectra of micro-organisms (K. P. Norris); Ultra-violet absorption spectra of proteins and related compounds (G. H. Beaven); Some recent developments in the theory of molecular energy levels (H. C. Longuet-Higgins).

As in the earlier volume, the various articles are complete in themselves, written by acknowledged experts in the various fields and each well provided with literature references. It may be noted that there is appreciably more subject matter to interest the practising analyst than there was in the first volume.

The editor is to be congratulated on his selection of contributors and in once more producing so well balanced a collection of informative articles. The many readers who have welcomed the first two of these "Advances" will look forward to the third, which "should make it possible to complete a survey of other established fields and to include a few of the very recent developments."

B. S. COOPER

TECHNIQUES IN FLAME PHOTOMETRIC ANALYSIS. By N. S. POLUEKTOV. Authorised translation from the Russian by C. NIGEL TURTON, B.Sc., Ph.D., and TATIANA I. TURTON, B.A. Pp. xiv + 219. New York: Consultants Bureau Enterprises Inc. 1961. Price \$9.50.

Few satisfactory text-books of flame photometry have so far been published in English. This volume is a welcome addition.

The initial sections deal with the theoretical basis of flame photometry, apparatus and general analytical procedures and the latter half of the book with the determination of individual elements.

The translators are to be congratulated in that there are few signs that this is a translation; the English style is simple and direct.

This book provides a useful introduction to the Russian literature, and analysts interested in flame photometry will find it a helpful addition to their libraries; however, the clarity with which the theoretical basis of the method is discussed make this text an excellent introduction for those unfamiliar with the subject. It is recommended.

IAIN MACINTYRE

EXPERIMENTAL THERMOCHEMISTRY. Volume II. Prepared under the auspices of I.U.P.A.C. by the Subcommittee on Experimental Thermochemistry. Edited by H. A. SKINNER. Pp. xx + 457. New York and London: Interscience Publishers Inc. 1962. Price 107s.

After the publication of "Experimental Thermochemistry" in 1956, a second volume was prepared by a similar I.U.P.A.C. Subcommittee on Experimental Thermochemistry. This book contains nineteen chapters. The first five of these, an introductory survey and four chapters on the particular techniques applicable to metals, organic fluorine, organic bromine and organo-metallic compounds, deal with combustion bomb calorimetry in which oxygen is used, with special reference to the moving-bomb technique. Next are two chapters on the use of fluorine as oxidant in bomb and in flame calorimetry. Then there are eight chapters on reaction calorimetry: introduction, design of reaction calorimeters, heats of hydrogenation and of halogenation, heats of hydrolysis, heats of polymerisation, high temperature reactions and heats of formation, solution calorimetry and silicate thermochemistry, and heats of mixing the constituents of binary liquid mixtures. The remaining four chapters deal with the problems peculiar to metallurgical and alloy thermochemistry, recent progress in microcalorimetry, biochemical and zoological thermogenesis as studied by microcalorimetry, and heats of biochemical reactions.



Not only will the combination of the first and second volumes provide a valuable text-book and reference book for all serious workers in the field of thermochemistry, for the second volume is an almost perfect complement of the first, but also the lucid explanations of methods for deriving quantitative information about the energetics of chemical change in biochemical and metallurgical systems will render this pair of volumes of interest to a much greater scientific readership. What the first volume lacked in application to inorganic and biochemistry, this volume discusses adequately, as well as expanding on the relatively recent methods involving fluorine and micro-calorimetric procedures. The book abounds with examples of procedures, with diagrams of apparatus and of electronic circuitry, and with tables and summaries of thermochemical publications. Little repetition is evident, but some overlapping with the first volume exists. Different numbering of steps unfortunately occurs in the several computation forms (the Washburn reduction type) used in analysis of the results from bomb experiments. The criticism that there are numerous references to chapters in the first volume is not wholly relevant, because many of the chemists interested in this volume will already have obtained the previous volume. The writing and the editing are otherwise generally good. Volume II of "Experimental Thermochemistry" is thus a useful book and a necessary companion to Volume I; together they constitute the modern definitive work in thermochemistry.

J. F. OGILVIE

REAGENT CHEMICALS AND STANDARDS. By JOSEPH ROSIN. Fourth Edition. Pp. viii + 557. Princeton, N.J., New York, Toronto and London: D. Van Nostrand Company Inc. 1961. Price \$14.50; 112s. 6d.

This edition follows closely the pattern of the third edition, which was reviewed in *The Analyst*, 1956, **81**, 731. The main difference is an enlargement by some thirty specifications for chemicals not previously included. With a total of over 600 specifications, the publication is one of the most comprehensive of its kind.

The new items include ten of the "essential" amino acids, and the tests prescribed for these substances are intended to ensure their suitability for use as reference standards, but no chromatographic or microbiological criteria are invoked. The vitamins nicotinic acid, riboflavin and thiamine hydrochloride are also newly introduced as reference substances. Other miscellaneous additions are ethoxyethanol, ceric sulphate, n-hexane, lead tetra-acetate, murexide, sodium tetraphenylboron and tetrahydrofuran.

The very wide coverage of this compilation allows it to serve a useful purpose as a supplement to official and proprietary publications of similar character, and this function is of particular importance in the U.S.A., where the standards of the American Chemical Society cover a comparatively restricted range of 234 reagents.

W. C. JOHNSON

GAS CHROMATOGRAPHY. By JOHN H. KNOX. Pp. viii + 126. New York: John Wiley & Sons Inc.; London: Methuen & Co. Ltd. 1962. Price 15s.

Some of the older generation of chemists tend to resent the present as an age of push-button chemistry, and it is true that the development of modern instrumentation allows certain otherwise complicated routine analyses to be carried out rapidly and accurately by trained, if unqualified, assistants, but the routine has still to be devised by one possessing the requisite fundamental knowledge and experience. This is nowhere more the case than in gas chromatography, where the problems of appropriate column filling, carrier gas, temperature and detector have first to be solved. For these, a knowledge of the fundamental theoretical background and of the factors that determine the desirable properties of the materials used is essential. This monograph provides this knowledge for gas chromatography. It deals with the underlying fundamental principles and theory of the subject; specific applications in analytical chemistry are not included. After an introduction, chapters deal with the theory of the process, columns and column packings, detectors, ancillary equipment and additional methods, such as multiple columns and temperature programming. Gas-chromatographic methods are rapidly becoming essential in all analytical laboratories and it is equally essential that the chemist charged with their application should be familiar with the theoretical background. This he can be by the study of this excellent monograph.

J. I. M. JONES