

Book reviews

OIL, DETERGENTS AND MAINTENANCE SPECIALTIES.

Vol. 1. B. Levitt. Pp. vii + 280 + Ill. (1967). *Chemical Publishing Co., New York.* \$13.75.

The emphasis of this book is in the basic practical application of knowledge acquired by the author over many years of experience in the manufacture of oils, soaps and detergents. The book in many ways resembles E. T. Webb's classic work *Soaps and Glycerine Manufacture* in which the same subjects are presented in a similar lucid manner devoid of excessive theoretical and technical discussion. It is very easy in this type of informative writing to become sidetracked by the hundreds of excellent scientific specialist papers which can only distract without satisfying the reader's interest in the main issues involved. The author has fortunately avoided these pitfalls, and each chapter is dealt with in a masterly and facile style, which can readily be followed by semi-technically trained personnel. The book is divided into nine chapters comprising the Introduction, Animal Fats and Oils, Vegetable Fats and Oils, Fatty Acids, Fatty Alcohols, Glycerol, Surfactants and Surface Activity, Production of Fats and Oils, Soap Manufacture, Synthetic Detergents, and finally Analysis of Oils and Detergents.

The second chapter deals concisely with the rendering of animal fats for soap making and the refining of fish oils such as herring, menhadden, salmon, pilchard and sardine oils for use in paint, linoleum and printing ink industries. The therapeutic values of the fish liver oils, followed by butter, margarine, lanolin and its derivatives, sperm oil and spermaceti and their applications are fully discussed.

The third chapter deals in like manner with about twenty of the better known vegetable oils and fats finalised in a chemical and physical constants table of 76 oils and fats each with their sources of origin.

Fatty acids, alcohols, and glycerol, their synthesis, characteristics and uses, are treated effectively in chapter four, followed by surfactants and surface activity and the importance of biodegradability of detergents in chapter five.

The production of fats and oils solvent extraction, continuous centrifugal refining, Solxol, Furfural, and Emersol processes, followed by a description of hydrogenation, sulphonation, the fat splitting processes and the production of glycerol, concludes an interesting and factual sixth chapter.

Perhaps the most important chapters in the books are the 7th and 8th which deal fully with the various aspects of soap and detergent manufacture which hold a mass of facts, figures and formulations most useful to the technician or chemist working in these fields. L. CHALMERS.

AEROSOL SCIENCE. Editor: C. N. Davies. Pp. xviii + 468 + Ill. (1967). *Academic Press, London, New York.* 115s. \$10.50.

It must be stated at the outset that the average cosmetic chemist will not find in this book an easy, intelligible introduction to the science of aerosols that will help him to bridge the gap between the technology and the fundamental science. "Aerosol Science" makes few concessions to a popular or even technologically based approach. It is a thorough, well edited account of the present state of this branch of colloid science. The book was almost devoid of direct reference to the more familiar manifestations and applications of the aerosol state, for example, fogs, smokes and atomizers were not discussed in practical detail.

Nevertheless, "Aerosol Science" is a very able compilation of up-to-date information, written by the leading practitioners of this subject. Physicists, colloid chemists and chemical engineers can derive considerable enlightenment from a study of the various chapters of this work. The first chapter of this book, dealing with the generation of aerosols is worthy of study of those practising a variety of scientific and technical disciplines. Chapters V and VI, which deal in detail with the transport influences on aerosol particles, namely thermophoresis, diffusio-phoresis and photophoresis will appeal to colloid chemists. An excellent chapter by R. G. Doorman on the filtration of aerosol particles would repay study by chemical engineers and others concerned in the processing and classification of powders. Chapter IX, on the adhesion to surfaces of particles is of general interest, if only because of the descriptions of elegant techniques for the measurement of this property. These techniques, incidentally, owe much to Tabor and his school at Cambridge.

To conclude, many industries which are more science-based than our own could derive immediate value from "Aerosol Science". Is it too much to hope that in the near future we may find available to us "An Introduction to Aerosol Science" in whose pages aerosol science and aerosol technology would be more strongly integrated?

F. J. MOTTRAM.

MODERN PRINCIPLES OF ORGANIC CHEMISTRY.

J. L. Kice and E. N. Marvell. Pp. ix + 449 + Ill. (1966). *Collier-MacMillan, London.* 70s.

This claims to be the "first brief text" presenting a flexible mechanistic treatment of modern organic chemistry. Brevity it certainly has: the authors cast a wide meshed net over a large proportion of the high seas of natural and synthetic organic substances, sufficiently superficially to require only 420 large-type pages; there is also one final chapter encompassing the diagnostic importance of the spectral properties of molecules.

An unusual feature of the presentation is the liberal use of brown type to emphasize key substituents or direct attention to particular reacting species or the nature of rearrangements. One must also praise the clarity of the structural formulae, wherein atoms other than carbon and hydrogen are set in heavy black type against the finely drawn hexagons, etc. There is also use of a paler brown background to set off, somewhat luridly, important tables or reaction schemes. Each chapter carries its own crop of graded problems although the answers are left to the class tutor.

The pattern of the book, admittedly reminiscent of the inestimable 'Cram & Hammond', is at first to introduce the necessary principles of nomenclature, structure and key reactions, before passing to the fundamentals of mesomerism, stereochemistry and structure correlation with reaction rate and equilibrium; these 10 chapters provide a reasonable framework for developing a general analysis of organic reactions. In the remaining five chapters the preceding treatment is applied to various classes of relatively sophisticated natural and synthetic products: carbohydrates, peptides, heterocyclics, terpenes and steroids, and macromolecules (including synthetic polymers). These chapters frequently degenerate into tables of illustrative formulae of arguable paedagogic value but the examples chosen are in many cases undeniably topical. One welcomes a brief but readable account of the principles, as currently held, of the theory of acetate-mevalonoid biogenesis of isoprenoids.

The ubiquity of contemporary deployment of spectrometric investigations has prompted a further chapter which briefly explains the absorption of electromagnetic radiation and then refers to frequencies for characteristic vibration (ir) and electronic (uv) transitions - the treatment of the latter being restricted to π -conjugated systems. There are three simple examples of diagnosis from ir spectra. Surprisingly the presentation of nmr spectrometry is rather less terse than for the more conventional techniques: chemical shifts and first order spin-spin coupling are briefly explained and exemplified. However, it is unfortunate that the chemical shifts are exclusively discussed in terms of delta ppm, without even a reference to the alternative (and now preferred) use of tau (10 - delta) units. Mass spectrometry and its potential development are merely mentioned in two valedictory paragraphs - but then it is difficult to see what could have been given in a book of these limited dimensions and scope.

The book should be judged as it is intended to be used, that is as a half-year introductory course for students who subsequently may proceed to a variety of life-science Honours courses. Given good tutorial support, orientated to the particular slant of the freshmen concerned, this text should provide a basic understanding of structural features and reaction driving forces, without overburdening memory with a welter of data in many cases unlikely ever to be retrieved. Honours chemistry schools would legitimately look elsewhere. G. F. PHILLIPS

INFRARED SPECTRA OF ADSORBED SPECIES. L. H.

Little. Pp. xii + 428 + Ill. (1966). *Academic Press, London/New York*. 100s. \$16

Books on ir spectra are numerous but those devoted to adsorbed species are few and far between. A number of papers relating to this topic have been published and this book with its 700 odd references and supplementary chapters by A. V. Kiselev and V. I. Lygin is basically a review.

The primary appeal will be for scientists interested in catalysis and for metallurgists and geologists but the field covered in the book is very wide.

There is extensive discussion of (a) the adsorption of gases and hydrocarbons onto metals and metal oxides, the mechanism of catalysis and differentiation between chemisorption and physical adsorption, and (b) surface hydroxyl groups and the general adsorption of molecules within clays and zeolites.

There are other chapters covering early Russian work and studies of the pertur-

bation of physically adsorbed molecules. Relatively little space is devoted to experimental techniques. These are well described but there should perhaps have been more emphasis on the importance of ordinate expansion for weak absorbers and ATR for surface studies on non-metallic substrates. The techniques are a limiting factor particularly if the studies are to be extended to natural surfaces.

There is no direct reference to any application in the toiletry or cosmetic field but where the hydrogen bond is involved there must be a link, however oblique, with the cosmetic research chemists' interests.

The book is quite readable but somewhat heterogeneous in presentation. It is a useful review and provides background references for a topic which is likely to become important in the future. D. M. GABRIEL.

INTERNATIONAL TABLES OF SELECTED CONSTANTS

15: SESQUITERPENOID. G. Ourisson, S. Munavalli and C. Ehret.

Pp. 70 + xxx. (1966). *Pergamon Press, Oxford*. 90s.

At some time or another, most of us – particularly those working in perfumery – require information on materials of natural origin. High on the list are the sesquiterpenoids since they are relatively widespread and also rather complex materials. Days, weeks or even months may be spent searching for information on a specific material. Having found something one has to estimate its accuracy and value, or the relative value of conflicting pieces of information.

Here is a book which does most of it for us, saving countless hours of often fruitless searching. Information on nearly five hundred materials is recorded in tabular form. This information includes melting and boiling point, density, refractive index, specific rotation and wavelengths of the absorption peaks in the uv. Bibliographica references are given to all the data together with references to further data on synthesis, on uv, ir, Raman and nmr spectra, on rotatory dispersion or circular dichroism, and on mass spectrum, and X-ray structure. Facing each table are structural formulas for the materials included in the table, where these are known, and the number which are not known seems now to be remarkably small.

Basically the materials are arranged according to the number and type of their carbon ring structure although the authors found this to be not entirely satisfactory and varied it in some cases. Separately there is an alphabetical list of the substances with details of their source or origin.

Over 1750 bibliographical references are given and these are arranged in chronological order from 1840 to 1965. An index of authors is included. Where discrepancies arise in results from different sources the authors have critically evaluated the original papers and used the figures which in their opinion are the most reliable.

The volume is basically in French but English translations of the introductory sections and the symbols and abbreviations, combined with the fact that mostly it consists of tables of figures and structural formulas, makes this immaterial.

There are bound to be some errors in a book such as this but none were noticed (except for minor translational quirks) and the overall excellent presentation inspires confidence in the fact that these are very minimal.

This first-class volume is an essential reference work for everyone whose work involves the sesquiterpenoid compounds. R. P. REEVES

INTERPRETED INFRARED SPECTRA. Vol. 2. H. A. Szymanski. Pp. ix + 304 + Ill. (1966). *Plenum Publishing, New York.* \$12.50.

Dr. Szymanski continues this long-term course in the education of the tyro organic spectroscopist, who should ultimately be able with confidence to interpret his own ir spectra and make his own identifications. The pattern of volume 1 of the series [reviewed *J.*17 434 (1966)] has been maintained: for successively complex functions, characteristic group frequencies are deduced and detailed correlation tables compiled for further prediction.

This second volume begins with the remaining hydrocarbon function not treated in volume 1: the alkynes. A full vibrational analysis is presented for eleven specific alkynes (including deuterium replacement) and then there is more general reference to acetylenic hydrogen and the CC triple bond in a large number of ethynyl and propargyl systems. The annotated spectra of 13 alkynes are reproduced. The only error observed (p. 7) is an assignment to aldehydic, rather than acetylenic, CH.

That section, however, only accounts for some 8% of the text: the major part is a remarkably full treatment of the aliphatic hydroxyl function: a family which – as the author recognises – seems to have attracted disproportionately less attention from other compilers. In particular little has been published on diol correlation studies. Dr. Szymanski supports his basic vibration analysis with a correlation table of group frequencies which can be used to identify primary, secondary and tertiary aliphatic alcohols, and proceeds to discuss in helpful detail four environmental factors (inductive effect; resonance phenomena; hydrogen bonding; conformation) which influence the group frequencies. There follows the annotated spectra of 247 alcohols, of which 51 are diols and 15 other substances containing more than two hydroxyl functions. In some cases, by virtue of the correlation deduced, Dr. Szymanski is able to extend the diagnosis of the originator of certain spectra to identify the specific isomer examined or detect components of mixed isomers or indicate the presence of congeneric impurities.

Another very useful facet of this volume is the provision of a cumulative index, wherein all compounds whose spectra have been interpreted in the two volumes are listed in ascending complexity of molecular (not “empirical” as wrongly cited in the text) formula. In each case the graphic formula is appended, which facilitates scanning the index for explicit structural features. This is similar to the provision made in *Formula index to nmr literature data* [reviewed *J.*18 265 (1967)], although in that text the elements C and H are deliberately the last choice in the ascending complexity sequence.

Thus we now have two useful volumes comprehensively analysing the ir spectra of hydrocarbons and the aliphatic hydroxyl function; one looks forward to seeing a similarly authoritative coverage of the fascinating subject of the variation observed in the ir spectra for different carbonyl environments. G. F. PHILLIPS

DISCUSSIONS OF THE FARADAY SOCIETY. No. 40
1965: INTERMOLECULAR FORCES. Pp. 291 + Ill. (1966).
Butterworth, London. 80s.

The 40th of a series of 'General Discussion' meetings organised by the Faraday Society was held at Bristol University during three days in September 1965; the 276 participants included visitors from 19 other countries. The meeting was built around the manifold studies currently being conducted for the understanding of 'Inter-molecular Forces'. The Society has now published under one cover the Spiers Memorial lecture with which Professor Longuet-Higgins opened the meeting, the 24 contributed papers, the text of the five general discussion sessions, and the synthesis of ideas and prospect in the summary by Professor C. A. Coulson.

Broadly speaking the papers fall into four groups. Those dealing with examination of interatomic forces in the gas phase are largely theoretical and require increasingly complex electronic computational assistance; a number of papers are concerned particularly with 3- (or even many-) body treatments and these concepts are extended to crystal structure. More complex discussion is needed to cater for the short-range repulsive interactions in the liquid and solid state; a few contributors have perhaps sought an interpretation that is too physical for some of their calculations. Useful papers quantify non-polar repulsion in a fluid or at a surface, but much more study is needed on absorption phenomena. The description of non-polar interactions in molecular crystals, and other polyatomic systems, are also largely of a repulsive character, depending little upon mutual orientation, but dipole-quadrupole interaction may lead to angular dependence. Of course where a molecule has a permanent dipole this may swamp the subtle defects described. Literally the most vital, and requiring the most indulgence in the way of assumptions, are interactions in biological systems. Crude estimations of non-bonding repulsion in peptide helices lead to predictions of geometrical rigidity for a given amino-acid sequence.

Perhaps the most striking feature of these papers is the difference in level of sophistication: some problems appear to require a profound study of forces between (say) gases; other (e.g. liquid-solid) interactions are examined from crude approximations and assumptions. The somewhat specialised interaction of the hydrogen-bond in organic systems was deliberately excluded from this General Discussion; no doubt a special meeting could be set aside - the Faraday Society last held one on this topic in 1940. This collection of papers is so broad ranging, and in many instances so specialised, that the book is unlikely to commend itself for general reading. Its value lies as a reference source to a broad spectrum of current thinking in the analytical treatment of the nature and magnitude of forces between molecules in many different physical states. This extension of physical chemistry was aptly summarised by Professor Coulson when he defined the discussion as a synthesis of theoretical physics and experimental chemistry. G. F. PHILLIPS