Reviews

THE PHASE RULE AND ITS APPLICATIONS. By ALEXANDER FINDLAY, M.A. D.Sc., F.I.C., revised with the assistance of A. N. CAMPBELL, D.Sc., F.I.C. Eighth Edition. Pp. xv + 327, with 163 figures. London: Longmans, Green & Co. Ltd. 1938. Price 12s. 6d. net.

As a guide and means of classification in the study of chemical equilibria in systems other than those which are wholly gaseous, the Phase Rule is still of particular value. Professor Findlay's exposition, first published in 1904 and long regarded as the standard English text-book on the Phase Rule, has been brought up to date again (editions were reviewed in THE ANALYST, 1923, 575; 1928, 244), and work published as late as 1938 is included. References to applications of X-ray analysis in Phase Rule problems are welcome additions, but it is to be hoped that in the next edition a more even balance will be struck between the applications to "non-metallic" systems and "metallic" systems, as the latter seem somewhat neglected in view of the present importance of alloys.

There are a few slips, such as a reference (p. 34) to the Appendix dealing with the experimental determination of the transition point, which has been omitted from the present edition, and it is a little confusing to speak of heated mercury *subliming* through a layer of liquid bromonaphthalene (p. 92), in view of the implied definition of sublimation (p. 21). However, the analyst will find underlying principles to guide him in some of his problems, as in converting insoluble systems into soluble systems by fusion (p. 287), and a word of warning that different substances with identical melting-points do not necessarily depress each others' melting-points on admixture (p. 124).

Notwithstanding such minor criticisms, this edition is a worthy successor to its predecessors. J. G. A. GRIFFITHS

MAY'S CHEMISTRY OF SYNTHETIC DRUGS. By PERCY MAY, D.Sc. (Lond.), F.I.C., and G. MALCOLM DYSON, Ph.D., F.I.C., A.M.I.Chem.E. 4th Edition. Pp. xii + 370. London: Longmans, Green & Co. Ltd. Price 21s.

Of the nature of drug action very little is known with certainty, but theories have been advanced from time to time, such as those of Ehrlich, who makes an analogy with dye action, and of Loew, who correlates physiological activity with the chemical affinity of a drug for aldehyde and amino groups, and the more modern theory of biochemical interference, which postulates modification of enzyme activity as the controlling factor. On the other hand, the manner in which a drug reaches the seat of its action is better understood, being in a measure dependent on physical properties, particularly solubility. Overton and Meyer, for example, long ago showed that a close relationship exists between the effectiveness of narcotics and their distribution coefficients between lipoid substances and water. It is with such ideas that the authors of this book are concerned in the three introductory chapters, which summarise the principles by which the chemist is guided when synthesising a new drug.

Chapter II is devoted to the physiological effects which are frequently associated with different atoms and groups, as for example, the action, on the central nervous system, of ethyl groups when introduced into a suitable molecule. A list of generalisations, known as Schmiedeberg's Rules, is followed by a discussion of the more important atoms and groups from this point of view, including the effect of unsaturation and stereoisomerism.

The subject of the next section—the chemical changes which drugs undergo in the organism—is of considerable importance, since a study of the elimination products of a drug may give a clue to its mode of action and even indicate the manner in which its structure can be modified in order to decrease its toxicity. As is mentioned later in the book, the discovery that aniline and its simple derivatives are eliminated from the body as a compound of *p*-aminophenol and glycuronic acid led eventually to the synthesis of phenacetin.

Following this general treatment is the main subject matter of the book which, owing to its diversity, offers some difficulty of presentation. The authors have not attempted a hard and fast systematic treatment throughout, but have chosen for their chapter headings the strongest common relationships between the substances described therein. Thus sometimes similar physiological effect is the keynote, as, for example, "Narcotics and General Anaesthetics," and at other times common chemical origin ("Adrenaline and other Derivatives of Ethylamine"). In fairness it must be said that this method produces a good sequence within the chapters, and possibly a more rigid classification would have produced a less readable book.

Since several of the natural alkaloids and many "artificial" ones have now been synthesised, this branch of the subject receives a considerable share of treatment. After an introductory chapter dealing with active groupings in alkaloidal structure, there follows an account of quinine and its derivatives, the alkyl hydro cupreines, and various quinine compounds of therapeutic value. Substitutes for quinine, such as Plasmoquin, are also described. Next we have

the properties and syntheses of atropine and the tropeines, followed by cocaine and its substitutes, the eucaines, stovaine, novocaine and other local anaesthetics. Although morphine itself has never been synthesised, many attempts have been made to prepare derivatives of it and to produce compounds containing similar groupings. In view of this, a résumé is given of the chemistry of morphine and its related alkaloids including members of the apomorphine group. Narcotine, papaverine, hydrastine and others of the isoquinoline group receive similar treatment and, wherever possible, full syntheses are indicated with references to the original work.

Because of the powerful physiological effect of many derivatives of ethylamine, these compounds have been grouped together under one heading and include adrenaline, ephedrine, benzedrine, histamine and similar bodies.

The most notable expansion of this edition is due to the addition of a chapter on Hormones and Vitamins. To condense such a subject into twenty pages was a bold undertaking, but the authors have at least succeeded in producing a useful summary of some of the results achieved. Syntheses of vitamins A, B_1, B_2 and C are given, and mention is made of the recent success in producing α-tocopherol (vitamin E). The hormones are represented by thyroxin and the sex hormones. It is obviously impossible to give more than a brief outline of the latter in such limited space, and the treatment has been confined to their origin, mode of action and relationships one to another. A useful diagram showing the mechanism of the action of the female sex hormones is given, and mention is made of the recently discovered synthetic derivatives of stilbene, whose activity actually exceeds that of oestrone. A list of references would have been a useful addition here for the reader who may require further information.

Organic antiseptics include the therapeutically active dyes (triphenylmethane series, trypan blue, etc.), the complex ureas (Bayer 205, S.U.P.), the sulphonamides and acridine derivatives (acriflavine, atebrin).

Compounds containing metals in combination are treated in two sections—the first dealing with those of mercury, silver and gold, and the second with those of arsenic, antimony and bismuth. These include most of the well-known general antiseptics and anti-syphilitics and need not be further commented upon here.

It is impossible in a review of this length to touch upon everything in the book; let it suffice to say that the authors have omitted very little of their legitimate subject matter. A justified criticism would appear to be that they have at times gone outside the scope of the title.

The book will be of considerable use to the organic chemist interested in the synthesis of drugs, and a source of stimulating ideas to all chemists, on account of the many ingenious synthetic methods abstracted from the freely-quoted patent literature. It will also be of considerable use as a reference book in view of the comprehensive index that it possesses. Finally, the account of many beautiful syntheses, invariably represented by graphic formulae, will be a useful aid to the student and save him much weary searching of the textbooks.

G. E. H. Skrimshire

CASEIN AND ITS INDUSTRIAL APPLICATIONS. By EDWIN SUTERMEISTER, S.B., and FREDERICK L. BROWNE, Ph.D. Second Edition. Pp. 433, with 35 Tables and 50 Figures. New York: The Rheinhold Publishing Corporation; London: Chapman & Hall, Ltd. 1939. Price 32s. 6d. net.

A new edition of Sutermeister is something of a major event in the casein world. The first edition appeared in 1927, when the industry was, relatively speaking, in its infancy, and at that time the book was more than a mere review of current practice and literature. It carried out invaluable pioneer work in pointing out the possibilities of the industry and emphasising the need for scientific control. In 1927, as now, the book impressed by virtue of its reasoned judgment. It has helped the development of casein by countering the somewhat extravagant claims made from time to time.

Even if in some degree the casein industry has not fulfilled the promise of its youth, it has developed to an extent which has made sections of the early Sutermeister begin to date. Eight of the original eleven contributors have collaborated in the new edition and parts of the book have been completely re-written. Parts are new not only in matter but also in emphasis. For example, in the United States the whole attitude towards casein manufacture has changed. When the first edition of the book appeared, casein was largely a by-product of the creameries, made in the simplest and cheapest plant available, with little control or scientific method. It is not surprising that the variable nature of casein made under such conditions led to a prejudice in favour of competitive materials and placed the industry under a handicap still felt to-day. Now casein of uniformly high quality is so widely available that material made by the old "hit or miss" methods is difficult to sell. Sutermeister can claim much of the credit for this improvement by the emphasis laid on scientific control in 1927.

Naturally the book has a strong American colouring, and statistics are mostly confined to the States. This colouring may be misleading, for some of the statements are not applicable to the British Empire. At any rate in the States, the vat method of self-souring would appear to have receded in importance in favour of "continuous" processes, and the latter, mentioned more or less in passing in the earlier edition, now receive detailed description. One "continuous" process, the Sheffield method of hydrochloric acid precipitation, is described at considerable length and would appear to be perhaps the chief development in manufacturing technique since 1927.

Although the book has been considerably enlarged, its fundamental honesty becomes apparent as much by its omissions as its additions. On carefully comparing sections, the disappearance of many minor applications of casein, which were pious hopes in 1927, but failed to become established on any appreciable scale, is noteworthy.

According to statistics quoted, the manufacture of casein in the States in 1937 was about five to eight times what it was in the immediate post-War years, and the consumption about three times. By far the greater part of this, possibly over 70 per cent., was used in paper coating. Plastics claim over 10 per cent. as second on the list, and the major usage in this field is in the manufacture of buttons. The chapter on paper-making contains little of novelty, and here the improvement

in the quality and reliability of casein has been the largest factor in its extended use. The chapter on plastics admirably reflects the changes of the last ten years, and the increase of the bibliography from 66 references in 1927 to over 400 in the new edition tells its own story. Even if the employment of casein in the manufacture of buttons stands out most prominently, other applications are still more than mere optimism, and the battle with phenol resins has not gone entirely one way.

The fascinating new development of "Lanital," synthetic textile fibres from casein, is fully described and, although the future of this product cannot yet be predicted, it would appear to have wide possibilities and is already being made on a fairly large scale in Italy.

The section on glues has been carefully revised and some valuable observations on "working life" added. Casein paints have developed markedly since the earlier edition of the book, and paste paints are virtually an innovation which has become firmly established since 1927. The chapter on paints has also been enlarged, and the bibliography both on glues and on paints considerably extended.

The chapter on the testing and analysis of casein has been brought up to date, and has been placed in a more prominent position in the book instead of being relegated to the end. The notes on ash determination are of special interest, even if the relationship between proximate ash-content and viscosity may be open to doubt.

Lastly, it remains to congratulate the authors and the publishers on the improved appearance of the book, the excellent quality of the illustrations and the increased clarity of the diagrams and tables. It is not unreasonable to assume that improvements in the quality of casein have played a part in this!

E. W. PATES

ORGANIC CHEMISTRY. Professor PAUL KARRER. Translated from the latest German edition by A. J. MEE. Pp. xx + 902. Elsevier Publishing Co., Ltd., Amsterdam and London. 1938. Price 45s.

In the preface the author states that his aim was to provide students with a textbook of organic chemistry of medium size which would give them a survey of the ever-increasing body of facts, and it may be said at once that he has succeeded in an admirable and praiseworthy manner.

In dealing with the main body of the subject, the historical and usual division into aliphatic, carbocyclic and heterocyclic compounds has been retained, although not slavishly followed. In each section the compounds are regarded as derivatives of the hydrocarbons and have been arranged, as far as possible, according to their functional groups.

As might be anticipated from a survey of the investigations in which Professor Karrer has played so brilliant a part, considerable prominence is given to the chemistry of naturally occurring substances, and various biochemical topics are dealt with in some detail. As some of the most striking and fruitful developments in the whole of organic chemistry in recent years have lain in the borderland of chemistry and biology, this emphasis on the biological aspect enhances in a very real way the value and utility of this book to the present-day student.

Although the number and variety of compounds dealt with are both large and

extensive, the book is eminently readable; it is far from being of the dictionary type and deals with synthetical methods in considerable detail.

By way of criticism it may be pointed out that the application of the principles of the electronic theory of valency receives scant and cursory treatment and is not even mentioned in the detailed index; it is surprising also to find numerous structural formulae in which nitrogen is represented as a penta-covalent element and many in which sulphur functions as a hexa-covalent element. The physico-chemical side of the subject is referred to here and there in an incidental and almost casual manner.

Whilst these omissions, from a textbook intended for the general student, of some of the more important developments on the theoretical side result in a certain loss of balance in the presentation of the subject, they do not seriously impair the general excellence of the work.

English students suffer from no lack of valuable monographs dealing with the theoretical and physico-chemical aspects of organic reactions, and they should be grateful that Professor Karrer has emphasised those sections of chemistry to which the term organic was originally applied.

The volume concludes with numerous tables of data which are both useful and interesting.

The translation has been well done and the English version reads smoothly and easily. The publishers have done their part well in the general make-up of the book; the paper is opaque, the type clear and legible and the binding strong and substantial.

It is to be regretted that the high cost may hinder the wide circulation that the book deserves and ought to have. J. KENYON

ANLEITUNG ZUR ORGANISCHEN QUALITATIVEN ANALYSE. By H. STAUDINGER and W. KERN. 3rd Edition. Pp. xvi + 157. Berlin: Julius Springer. 1939. Price RM.6.90.

This well-known textbook has undergone little essential change since the previous edition of 1929. It has, however, been revised and brought up to date by the inclusion of much new material. Thus one finds descriptions of the use of Girard's reagent for aldehydes and ketones, dinitrochlorobenzene for phenols, anthraquinone-β-carboxylic acid for alcohols, di-p-dimethylaminophenyl-carbodi-imide for acids, and other reagents of a similar nature.

This is not a textbook that can be used by itself for the complete identification of individual substances. It is a guide or key (Anleitung) to assist the student in classifying an unknown compound, so that, having put it into the right pigeon-hole, he will be able to identify it more easily. For this final stage, the student is referred to Kempf and Kutter's *Schmelzpunktstabellen zur organischen Molecularanalyse*. Dr. Staudinger's system of classification consists in dividing substances first into two groups, namely, those that boil below 160° C. and those that boil above that temperature, and then each group into five sub-groups according to the behaviour towards water and ether, and finally each sub-group into acids, phenols, bases and neutral substances. Such a scheme has obvious advantages, though it is easy to imagine that a substance might turn up in two of the ultimate divisions, because

its properties happen to fall along the arbitrary boundary-line dividing two of the sub-groups. But doubtless the author has allowed for this possibility.

The book is furnished with a good index of substances, but not with an index of reactions. This is unfortunate, as the preparation of derivatives is a particularly strong feature of the book, and the absence of an index renders reference to these a troublesome matter. F. A. ROBINSON