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EDITORIAL

The Raw Materials of Books

A LANGUAGE is a living thing, ever changing, ever growing. Old words and old usages die out, or remain dormant for a century or more, and are then revived by a few enthusiasts: new words are continually introduced, and new phrases; some of these become so useful as to find welcome places in our writing: some become so hackneyed as to be irritating: some speedily disappear. Our written language differs in many respects from our spoken language—and our written language is by no means uniform—but both these preserve to-day many relics of the past, fossils from far earlier deposits. This feature is characteristic also of the few other languages with which we are acquainted.

Let us begin with words, the elements from which we build up our sentences. So far as we are aware, there is no reason to think that there was a primitive Aryan race, but there certainly must have been a primitive Aryan language and a few of our oldest and most familiar words are common to the Aryan languages generally and are derived from a time before the divisions of the common tongue took place, and before the nations and races who spoke them were dispersed over Europe and some parts of Asia. Among these earliest words are those we now recognize as father, mother, daughter, son, foot, tooth, hound, goat, goose, sow, ewe, cow, ox, wheel, yoke, ore, door, thatch, weave, tree, wolf, otter, mouse, night, star, dew, snow, thunder, and wind.

The Teutonic language from which English is derived had originally many close connexions with other European languages, but by the time the Angles, and the Saxons, and the Jutes came to this country, the similar dialects these people spoke had come to differ very greatly from the Celtic languages found in Britain. The invaders learned from the invaded a few Latin words, such as camp, street, mile, wall, cat, ass, chest, pound, inch, copper, money, and wine, and a few Celtic words, such as dun and coombe. From the Scandinavian pirates or colonists they acquired such words as fell, husk, dairy, fellow, gait, kindle, odd, root, shy, tarn, ugly, and weak, as well as very many dialect words of which beck and thorpe are examples. After the Norman Conquest there was a great influx of French words, including a number of words the Normans had picked up from other nations; thus we adopted from the French such Celtic words as beak, car, carpenter, chariot, garter, javelin, mutton, petty, and varlet. We do not propose to give a list of the French, Latin, Spanish, and other words that were introduced into English during the Middle Ages: they are very numerous. We absorbed into English many Arabic words, for instance: alkali, arrack, azimuth, henna, otto, sofa, and taraxacum: we absorbed other Arabic words previously acquired by other peoples; thus through the Latin language we took these Arabic words: gypsum, naphtha, alcohol, algebra, tartar, artichoke, and zero. Long lists of words taken from other languages will be found in etymological dictionaries and historical grammars.

Meanwhile new words were coined by writers in this country to express new ideas or to replace words forgotten or unpopular. Robert Boyle, the father of chemistry, introduced the words pendulum, intensity, pathological, corpuscle, essence, and the noun, fluid; Evelyn introduced: outline, attitude, cascade, and opera. To Sir Thomas Browne we owe: hallucination, insecurity, antediluvian, medical, literary, and electricity; to Milton we owe: gloom, rumoured, and impassive; to Lord Chesterfield we owe: etiquette, picnic, and persiflage. Huxley gave us agnostic; Galton gave us anticyclone; Luke Howard gave us the names of the clouds, cirrus, cumulus, and nimbus; Whewell gave us the word scientist, a useful word but not a favourite. We got constituency from Macaulay, and dramatist from Cudworth. Burke gave us: colonial, diplomacy, federalism, electioneering, financial, and municipality. Among chemical terms we owe aniline to Fritzche, benzine (now benzene) to Mitscherlich, catalysis to Berzelius, catalyst to H. E. Armstrong, colloid to Graham, electron to Stoney, gas to Van Helmont, glycerine to Chevreul,

helium to Frankland, hydrogen to Lavoisier, iodine to Courtois, ion to Faraday, isotope to Soddy, neon to Ramsay, nitrogen to Chaptal de Chanteloup, *oxygen to Lavoisier, paraffin to Reichenbach, radium to Curie,* spectrum in its modern sense to Newton, toluine (now *toluene*) *to Berzelius, and vanadium to Sefström. Such* lists might easily be greatly extended: we recently *prepared a list of nearly two hundred Greek words that have* been made use of by chemists as a foundation for modern *chemical terms. It would be interesting* (a word we owe to Sterne) to trace the authors of several of our common *chemical terms, valency, viscosity, and india-rubber,* for instance. While these and scores of other new words have been introduced, scores of old words have disappeared or almost disappeared from our vocabulary; several of these would, before now, have become extinct but for the efforts of those who love archaic words and archaic usages. There is no reason why a few of these should not occasionally be used but as a general rule they do not improve writing; they stand out in modern prose as relics of a bygone age and are usually as incongruous as eighteenth century furniture in an obviously twentieth century room. Among such words we are inclined to include albeit, haply, perchance, proven, whit, ere, an (for if), and maybe. Among the modern words too much favoured by the fashionable journalists are hectic, meticulous, slogan, happening, and intrigue (in the sense of interest). These words have their place; their place is the garage or the saloon bar, not the austere page of a scientific journal.

What is true of single words is also true of short phrases; some old ones die, others are discovered. We all remember *Churchill's* "*terminological inexactitude,*" the "certain liveliness," and "according to plan." *Some phrases have become so hackneyed that grown-up* people are tired of them; we would gladly introduce to *our young children such morsels as weaker sex, olive* branches, staff of life, strong silent men, magnetic personalities, more *by* token, chartered libertine, better half, inner man, the psychological moment, the gentle art, and we may make use of these phrases at tea-time or at a cock-tail party, but we should not display them before learned professors, erudite lecturers, or students who are familiar with English literature. Some of our stock phrases are relics of popular proverbs or proverbial phrases handed down through many generations of learned and unlearned people; plentiful as blackberries, black as pitch, cold as charity, drunk as a lord, and so on; our speech is full of them, but we do not need them in writing, at any rate in writing with any attempt at style. Many proverbs and proverbial phrases were old in the time of Chaucer, thus: to call a spade a spade, a storm in a tea-cup, appealing from Philip drunk to Philip sober, making a virtue of necessity, to eat with the devil you need a long spoon, murder will out, all is not gold that glitters, man proposes but God disposes, out of sight out of mind, spare the rod spoil the child, *do not look a gift horse in the mouth, strike while the* iron's hot, all's well that ends well, better late than *never, a rolling stone gathers no moss. In the time of* Queen Elizabeth and King James I we find: time and *tide wait for no man, fast bind fast find,* comparisons are odious, by hook or crook, smell a rat, wits going *wool-gathering, went away with a flea in his ear, ther many a slip 'twixt the cup and the lip, look before y leap, make hay while the sun shines, and many mo* In Cervantes' Don Quixote, in Heywood's Proverb Tusser's Five Hundred Points, Shakespeare's Play Ray's Proverbs, the Proverbs of Hendyng, and Stephe Gosson's School of Abuse there are many such; fro *the last we may quote: a bad excuse is better tha* none, enjoy peace with provision for war, it is not goo *jesting with edge tools, beggars must be no choosers* From such old proverbial sayings, from the Bible an the Prayer Book, from Horace and Ovid, from Terenc and Plautus, from the Elizabethan playwriters and fro Cervantes and Rabelais, and many others there hav descended to us thousands of neat phrases, or musica lines, or noble thoughts that a writer who has discretio may use to his advantage. The old writings are then selves a storehouse of still older writings: Milton in hi Areopagitica refers to St. Paul "who thought it n defilement to insert into holy Scripture the sentences o three Greek poets and one of them a tragedian" Shakespeare's plays and those of Beaumont and Fletche preserve many lines and verses of earlier songs.

So too there are many sparkling sayings recorded i biographies and books of philosophy. The chemis Priestley quotes Bishop Warburton as saying "Orthe doxy is my doxy: heterodoxy is another man's. Lord Coleridge quotes Mr. Justice Maule as comparin a demeanour to the attitude of Almighty God to a blacl beetle. It was Dr. Thompson, once Master of Trinity who said, referring to Gerald Balfour "We are none o us infallible, not even the youngest of us." It wa Motley who said "Give me the luxuries of life and care not who has the necessaries" and Sir Wilfre Lawson who defined *a baronet as "a man who ha* ceased to be a gentleman and has not become a noble man." There are innumerable witty sayings attributec to Dr. Vaughan, John Bright, the Duke of Wellington Sir Frank Lockwood, and others, and a few of these sayings have become the stock-in-trade of literary people

What use should be made of old phrases, old lines o poetry, old jests, epigrams, and repartee? When and how should an author quote from other authors or refer to "the sleep of the just" or a "brother of the angle"? These are difficult and necessary questions First of all, in treating of serious topics such quotations should only be used if they convey neatly or precisely the meaning the author wishes to convey. Sometimes a line of poetry survives because of its compactness its *curiosa felicitas.* Matthew Arnold tells us: "Have something to say and say it as clearly as you can That is the secret of style." Macaulay says "The first rule of all writing—that rule to which every other is subordinate—is that the words used by the writer shall be such as most fully and precisely convey his meaning to the great body of his readers." These are strict words subject to qualification, for he tells us also "the public judges and ought to judge indulgently of periodical works" so that a journal is obviously allowed rather more latitude. Matthew Arnold also is not to be taken too literally for he somewhere quotes, apparently with approval, the saying of Mr. James Gordon Bennett that a good editorial is the highest achievement of the human

intellect. The editor of a periodical is to be given a special privilege: he resembles the men who make speeches as described by Lord Rosebery: sometimes they speak because they have something to say, sometimes because they have to say something. Let us for the moment ignore the privileged editor; what should less-favoured people do with time-honoured phrases and with quotations of other sorts? To begin with they must use quotations—if at all—suited to the subject, and to the readers, and to the author. If the author cannot somehow make the quotation seem to be apropos, probably it had better be omitted. In such a journal as this a few readers have a recollection of Horace and Virgil; they will be glad to have their halcyon days of youth recalled to them. Much might be written on the word "halcyon." This ostentation of superior knowledge, we mean the quotation of Latin, should in this jonrnal only be indulged in four times a year. On the other hand many readers have a recollection of Milton and Shakespeare; it is therefore better if you quote from these authors to quote correctly; verify the quotation, because if you do not the editor will, and he is unreliable. Quote "To-morrow to fresh woods and pastnres new" from Milton, and from Shakespeare "I will a round unvarnished tale deliver," and "An ill-favoured thing, sir, but mine own." If you quote from a language or a dialect with which you are not perfectly familiar do not advertise your unfamiliarity. "*Per se*" does not mean "alone," nor "*cui bono*" "what good is it?" If you wish to say the consumption of butter is so much per head in this country, do not say "*per capita*." *Per capita* is a well-known and correct phrase but it does not mean *per head*. Sassenach does not mean an Englishman, but a man who is not a Highlander; so too, "ilk" does not mean a family, or a clan, or a calling: it means "the same" or "that same place"; there are Macleods of that ilk, meaning Macleods of Macleod; there are Drummonds of that ilk, meaning Drummonds of the castle or estate of Drummond; there are no Mackenzies of that ilk, for there is not now and never was an estate or castle of Mackenzie; nor were there any Macdonalds or MacGregors of that ilk. The MacGregors were, however, not without honour; where the MacGregor sits is the head of the table.

The use of words, phrases, and quotations, is, like the rules of punctuation, no slight matter: those who wish to learn the former should study the works of Skeat, Morris, Pearsall Smith, Fowler, and Bradley, from whom we have gleaned most of our facts, and they should read Arnold, Huxley, Praed, Stephen, Calverley, Gibbon, Lang, Birrell, Bentley, Peacock, Lamb, and so forth. From such writers and from Addison, Kinglake, Scott, Stevenson, Lucas, Tomlinson, Tennyson, and other masters one may learn how English should be written in this island and at this time.

We do not presume to indicate all writers of good English or all favourite authors. Each writer must choose his own, bnt if he proposes to take them as examples of style, let him choose them carefully. Many excellent authors have styles that should not be imitated by the ambitious.

REVIEWS

THE A.B.C. OF CHEMISTRY. By J. G. Crowther. Pp. xi + 248. London: Kegan Paul, Trench, Trubner & Co., 1932. 4s. 6d.

It is a truism, as the author says, that life is not in any degree intelligible without chemistry. The difficulty is to bring some knowledge of chemistry home to the masses who have not yet acquired the mentality to understand its simplest expressions, though the same public readily understands and speaks learnedly about motor-cars and the radio. A more attractive form of elementary chemistry must be taught in the schools, perhaps dealing first with the facts of everyday life and afterwards with their theory, instead of starting with the atom. The attempt to write for the masses must continue until a book arrives which will be widely read because of its intelligibility and interest. Mr. Crowther has contributed another to the growing number of such books, its chief feature being the placing of theory after the descriptive chapters, which deal with a variety of subjects affecting our lives, blood, digestion, food, vitamins, hormones, drugs, passing on to agriculture and a number of phases of industry.

The subject is developed from the historical point of view, simple language being used and pains taken to make the short sections readable. Criticism of a book of this kind is difficult, since opinions as to the value of potted chemistry must differ widely, and it is difficult for a chemist to gauge whether the amount of information given is sufficient to hold the interest of the lay reader. When he comes to theory Mr. Crowther becomes more erudite and takes the ordinary reader quite out of his depth, whilst there are many who will consider his treatment is of questionable accuracy. These are however but small blemishes in a book which may do much good. E. F. A.

DIZIONARIO DI CHIMICA GENERALE E INDUSTRIALE. By Prof. M. Guia and Dr. C. Gaia-Lollini. A—E. Pp. 1083. Torino: Unione Tipografico-Editrice Torinese, 1933. 165 L.

This dictionary is an excellent production; the first volume (A—E) contains more than a thousand pages each about 7 in. × 10 in., clearly printed on good paper with many first-class illustrations of industrial plant and processes, apparatus, diagrams, tables of specific gravity and such data, structural formulæ, maps, and portraits of chemists; these last accompany many of the brief biographies of chemists that are included in the dictionary; for instance there are portraits of Bertagnini, D. Berthelot, M. Berthelot, Berthollet, and Berzelius. The authors have taken their information from many sources and have included many recent references; thus the account of Courtois refers to a short account of that chemist which appeared in this JOURNAL last year. The articles appear to have been carefully written and references are given to recent text-books dealing with the subject. The article on the elements occupies about six pages, that on electrons about three, that on chemical equilibria about six pages, that on ethyl alcohol about ten. We think that any chemist who can read either Italian or French will find this

book extremely useful. The authors are to be congratulated on their work.

AN INTRODUCTION TO ORGANIC CHEMISTRY. By J. D. Garard, Ph.D. Pp. ix + 296. New York: J. Wiley & Sons; London: Chapman & Hall, 1932. 16s. 6d.

In his preface Prof. Garard states that "this book has been designed for those introductory courses in organic chemistry which extend over just one semester," and therefore the major portion of the text is devoted to aliphatic compounds. At the same time the author has not neglected the aromatic section, and has even included a concise account of some heterocyclic substances and dyestuffs, the book concluding with a chapter on practical work, in which directions are given for the examination or preparation of 28 well-selected compounds. The arrangement of the subject matter is somewhat unorthodox in that the section on heterocyclic compounds precedes the chapters on aromatic substances. In so far as the book provides a "rounded" course for students of medicine, dentistry, pharmacy, and biology it can be thoroughly recommended, being accurate, concise, and very readable; but as an "introduction" for those who are reading for a degree in chemistry it is not quite so suitable, because certain aspects, for example the methods of deducing molecular formulæ and the evidence on which given structural formulæ are based, have not been sufficiently stressed. W. H. B.

AN INTRODUCTION TO ORGANIC CHEMISTRY. By A. Lowy, Ph.D., and B. Harrow, Ph.D. 3rd ed. Pp. xiv + 412. New York: J. Wiley & Sons; London: Chapman & Hall, 1932. 18s. 6d.

In preparing a third edition of this book the authors have taken the opportunity of incorporating many of the recent advances in our knowledge of organic chemistry, and therefore the volume under review is no less welcome than its predecessors. The success achieved by this work must be attributed to the concise yet lucid and attractive manner in which the subject matter is presented. Although in the main the book follows the usual plan, passing from considerations of structure through aliphatic and aromatic compounds to heterocyclic substances, it possesses several noteworthy features, the more prominent being an array of graphic formulæ and a series of charts and plans in which are set out particulars of the replacement of elements and groups, organic type formulæ, the uses of methyl alcohol, ethyl alcohol, formaldehyde, acetone, and acetic acid, the products obtained from ethylene, cellulose, and coal, and the position of entering substituents in the naphthalene ring.

In addition to being a good introduction to the study of general organic chemistry, the book will be extremely useful to those students who are taking medical and biological courses, as it contains short sections on lipoids, nucleoproteins, foodstuffs and metabolism, plant and animal pigments, enzymes, vitamins, and hormones. The numerous references to original papers, a large and well compiled list of reference books, and a chapter devoted to nomenclature of organic compounds will be appreciated by those students who, having read this volume, intend to pursue a more advanced course of study.

AN INTRODUCTION TO CHEMISTRY. A Pandemic Text. By J. A. Timm. With a Foreword by J. Johnston. 2nd edition. International Chemical Series. Edited by J. F. Norris, Ph.D. Pp. xx + 553. London: McGraw-Hill Publishing Co., 1932. 21s.

Many improvements have been effected in the second edition of this book, as compared with the first. Much of the more advanced mathematical treatment has been eliminated and the general arrangement has been markedly improved. The chapter dealing with alloys, which contained originally a much too advanced phase equilibrium treatment and was interposed between chapters on solution and electrolytic dissociation, has been deleted, particulars of some of the commoner alloys having been incorporated in the chapters on metals and iron and steel, whilst the sections on atomic structure, the emission and absorption of radiation, and related topics have been shortened and grouped much more satisfactorily. Additions to the book include a chapter on the ceramic industries and new material on the history of chemistry. Whilst the present volume retains certain shortcomings, particularly as regards lack of balance, it provides an interestingly written introduction to modern chemistry. The price, however, seems high, despite the excellence of the type, paper, and binding. H. F. GILLBE

LABORATORY METHODS OF ORGANIC CHEMISTRY. By L. Gattermann. Completely revised by H. Wieland. Translated from the 22nd German edition by W. McCartney, Ph.D. Pp. xviii + 416. London: Macmillan & Co., 1932. 17s.

For many years past "Gattermann" has been a household word among teachers and students of organic chemistry, and judging by the new English edition of this work the name will not lose any of its lustre for many years to come, for the service rendered to students of chemistry by Ludwig Gattermann has been worthily maintained by Prof. Wieland in revising the text of this book.

A scientific book that will survive 22 editions, the latest of which is no less welcome than the first, must possess some uncommon and attractive features. One of these features was aptly described by Gattermann himself when, in the preface to the first edition, he stated that "each separate preparation is followed by general considerations which concern the nature and the significance of the reactions involved and aim at imparting to the student, already during his practical work, the widest possible range of theoretical knowledge."

Realizing the importance of this feature, Prof. Wieland has made the theoretical discussions still more complete, and in the present edition several recent investigations, including Diels' diene synthesis and work on polyenes and hæmin, are discussed. Other new features are accounts of two enzymic reactions. The saccharification of potato-starch is carried out (with reference to the quantitative aspects) and the mash is subsequently fermented. In addition, the preparation of invertase

from yeast and the polarimetric observation of the inversion of cane sugar are described. Alkaloids are now represented by nicotine, details for the isolation of this base from tobacco extract and notes on the methiodide and nicotinic acid being provided. Nothing more need be said to commend this excellent book to the notice of teachers and to those students who have some acquaintance with practical organic chemistry. British and American students owe a debt of gratitude to Dr. W. McCartney of Edinburgh University for this very good translation. W. H. B.

STRUCTURE OF MOLECULES. Edited by P. Debye. Authorized Translation by W. M. Deans, M.A., B.Sc. Pp. vii + 190. London and Glasgow: Blackie & Son, Ltd., 1932. 15s.

The growing interest among chemists in the more physical aspects of molecular structure has created a demand for a book of this type. It is a collection of papers contributed at a symposium last year in Leipzig, and brought up to date by the authors in the course of preparation of the English translation. The first article by K. L. Wolf deals with the problem of free rotation about the carbon–carbon bond, and has a special interest for organic chemists. R. Mecke has contributed an account of recent work on the strength of atomic bindings, developed from the study of the band spectra of polyatomic molecules, this being followed by articles by F. Rasetti and G. Placzek dealing with Raman spectra and the determination of the vibration frequencies in molecules. At this point the information to be obtained about molecular dissociation from the study of band spectra is treated in a theoretical paper by Miss Sponer, this being followed by a contribution from Victor Henri summarizing a large amount of the most recent experimental work on predissociation spectra, and the photochemistry of such molecules as acetaldehyde and nitrogen dioxide. Finally, there is a theoretical paper on predissociation by R. de L. Kronig and an article by G. Herzberg on valency and the electronic structure of molecules.

The book will be of the utmost value to spectroscopists and to physical chemists working on photochemical problems. It assumes a considerable knowledge of the physical treatment of the subject, and would undoubtedly present difficulties to a reader insufficiently equipped in this respect. One wonders, however, for how long it will be possible for chemists in general to remain in ignorance of the quantitative treatment of molecular structure which is developing so rapidly at the present time, and to which this volume forms an admirable introduction. The value and interest of the book is considerably enhanced by the fact that it gives little indication of being a translation; also it has a full author and subject index, and contains many references to the most recent literature.

H. J. EMELÉUS

MANIPULATIONS DE CHIMIE. By C. Duval. Pp. vi+375. Paris: Masson et Cie, 1933. 65 fr.

This extremely useful book contains practical directions for carrying out 300 manipulative exercises in inorganic chemistry and 420 in organic chemistry. The directions are accompanied by references to original sources of information and, where necessary, by clear diagrams of apparatus; there are, in fact, ninety such figures. It is claimed that the exercises can be performed with comparatively simple apparatus and with inexpensive materials, and that experiments which would continue longer than a week have been omitted. The exercises are chiefly such as lead to the preparation of compounds of which characteristic physical constants are recorded, but not, as a rule, analytical reactions. An attractive feature of the book is the arrangement of the exercises according to the methods employed, and not according to the elementary composition of the products obtained. Thus, after a general indication of methods of heating, distilling, operating under pressure, etc., the preparation of a number of gases is described, and this section is followed by others exemplifying the action of gases on solids and liquids, reactions in tubes, hydrolytic reactions, dehydrations, oxidations, reductions, double decompositions, reactions at high temperatures, the determination of an atomic weight, the conductivity of electrolytes, allotropy, polarimetry, reaction velocity, mass action, catalysis, periodic reactions, complex salts, electrolysis, colloids, etc. The organic part deals with the reactions of organo-metallic compounds, halogenation, nitration, nitrosation, sulphonation, condensation, polymerization, etherification, saponification, cyclisation, oxidation, reduction, amination, diazotisation, syntheses, and the preparation of characteristic derivatives, etc. There are, for example, exercises involving the use of 28 different methods of oxidation, and 13 different methods of iodination. There is an excellent index combining names, apparatus, methods, and materials, and a detailed table of contents in which the exercises are classified under the above headings. A. A. E.

GMELINS HANDBUCH DER ANORGANISCHEN CHEMIE. Edited by the German Chemical Society. 8th edition. *System-Nummer 58: Kobalt. Teil A.* Lieferung 2. Pp. 221—502. Berlin: Verlag Chemie G.m.b.H., 1932. 48 m.; subscription, 42 m.

The present part of the volume dealing with cobalt is concerned only with the compounds of that element. These compounds embrace those in which occur practically every remaining element, certainly all the commoner, and in addition some of the rarer ones. In every case, binary salts and salts of the oxy-acids are disposed of first, then follow the double compounds in which a second metal is involved. Naturally, many a well-known co-ordination compound, cyanide, nitrite or oxalate, appears here. Some idea of the thorough nature of the compilation may be gathered from the fact that 270 pages have been required to cover the ground above indicated. This section concludes with about ten pages on that ever-green cobalt problem, the relationship between colour and constitution in its salts. Volume by volume the Handbuch grows, a monument to the patient industry of those who prepare the text, and a first call on the expenditure of every library with pretensions to a chemistry division. P. L. ROBINSON

GMELINS HANDBUCH DER ANORGANISCHEN CHEMIE. Edited by the German Chemical Society. 8th edition. System-Nummer 59: Eisen. Teil B. Lieferung 5. Pp. 873—1166. Berlin: Verlag Chemie, G.m.b.H., 1932. 53.50 m.; subscription, 47 m.

This section of the great monograph which is being constructed on iron deals with compounds of the element containing the alkali metals, ammonium, the alkaline earth metals, gallium, the zinc sub-group, manganese, the titanium, tin, and chromium sub-groups, nickel, cobalt, and the rare earths. The amount of space devoted to the different topics varies greatly, the well-tilled field being thus readily distinguishable from the comparatively uncultivated ground. The ferrites, ferrates and perferrates are mentioned, then follow the *double halides, sulphates, thiosulphates, carbonates,* formates, oxalates, cyanides, silicates, and phosphates so far as available information allows. Such a list serves to show the scope of this part of the Handbuch, and might be taken to indicate a miscellany of information of little interest to anyone. The impression left, however, is far otherwise: these pages will be dipped into with delight by the curious who happen to be possessed of an *inorganic* turn of mind.

P. L. ROBINSON

HANDBUCH DER ANORGANISCHEN CHEMIE. Edited by Dr. R. Abegg, Dr. F. Auerbach, and Dr. I. Koppel. *Part IV.* Division 3, *Part II*, B. Lieferung 2.-Komplexe Cyanide des Eisens. Pp. 465—B674. Leipzig: S. Hirzel, 1932. 24 rm.

It has become almost a commonplace to pay a glowing tribute to the writers of the volumes of "Abegg." To do so in the present review is no mere formality. Priv. Doz. Dr. H. Carlsohn, the author of the new section dealing with the complex cyanides of iron in which that element has valencies of two and three, richly deserves such an acknowledgment. He has had a most complicated subject to deal with but his work has been carried out with a thoroughness and judgment which calls for unqualified praise and which ensures the maintenance of the high standard characteristic of all the earlier volumes. The physico-chemical aspects of the different subjects are particularly well treated. Thus the intricate electrochemistry of the ferro-cyanides which has engaged the attention of numerous investigators is clearly surveyed *whilst the photochemistry of the ferro- and ferri-cyanides* is presented concisely but attractively, and there is much of interest in the chapter devoted to the isomerism of the ferrocyanides. Although the suggestion that potassium ferrocyanide exists in two isomeric forms has been shown to be erroneous the isomerism of the tetramethyl ferrocyanides appears to be well established. Hölzl considers that the α-form is the non-electrolyte $[(CH_3NC)_4Fe(CN)_2]$ and the β-isomer the electrolyte $[(CH_3NC)_4Fe](CN)_2$. Glasstone however suggests that the isomerism is not structural but due to the cis- and trans-isomerism of the six point system $[Fe(CH_3NC)_4(CN)_2]$. The colour reactions of the nitroprussides are always intriguing. A most informative chapter considers these reactions with alkali sulphides, ketones, and other organic substances. An admirable section deals with the analytical behaviour of the complex cyanides. The ramifications of the complex cyanides in colloid chemistry demand some mention and here again the treatment is adequate. A section on technology completes a scholarly production. In commending this book unreservedly to all engaged in either purely scientific or industrial chemistry the following comments may be of use in future editions: p. 509 (last two lines) should read as follows:

a : b : c = 1·645 : 1 : 1·061. β = 121·26′ (Wyrouboff). Die Kristalle sind nach (010) *un* vollkommen spaltbar.

p. 492 line 13 should read (3431,0) nach *kurzeren* Wellen hin verschoben.

There is also a slight crystallographic error on p. 520 (last two lines), and an error on p. 480 (nine lines from bottom). Although the *X*-ray results indicated the formula $Fe[Fe(CN)_6]$ to be highly probable yet the experimental work cannot be regarded as decisive.

W. WARDLAW

TRAITÉ DE CHIMIE MINÉRALE. Vol. II. Soufre-Sélénium-Tellure. Industrie de l'acide sulfurique et de l'oléum. By P. Baud, A. Conduché, and others, published under the direction of P. Pascal. Pp. xxi + 594. Paris: Masson et Cie, 1932. 120 fr.

Only a few years ago anyone carrying out original work on the sulphur group of elements had to hunt out most of the literature for himself. Most of the modern treatises on inorganic chemistry had begun on the earlier groups and for one reason or another had not yet got as far as group six. That difficulty is now removed, since both "Abegg" and "Mellor" are complete except for portions of the eighth group. M. Pascal's Treatise should be a valuable addition to the literature of this type. It is scheduled to appear in twelve volumes, and the order in which these are appearing is at present the opposite of the more customary one. It began at group seven and is working backwards.

The present volume gives an excellent review of the physics and chemistry of sulphur, selenium, and tellurium, including work done up to the middle of 1930 or, in some sections, of 1931. It does not attempt to refer to all the papers that have ever been published on these elements, but those omitted are essentially of minor importance, or such as had been dealt with in papers of a later date which are discussed in the treatise. The treatment is to some extent critical, which makes the volume more readable and useful than it would otherwise have been, especially as the authors of the various sections have on the whole shown a sound appreciation of all the points at issue. The critical method has its drawbacks. In some cases—as in the discussion of the mode of formation of the thionic acids—it has led to a rather one-sided explanation without indication that others are possible.

The last 90 pages of the book give a useful summary of every stage in the manufacture of sulphuric acid. The volume is well printed and appears to be very free from misprints. The literature references are given in groups, to which it is easy to refer, at the end of each

important section. In order that there should be no difficulty in finding them, the page on which the appropriate group of references occurs is given at the foot of *each* page of the book—a practice to be commended for works of this nature. There is a short but serviceable index. H. BASSETT

TRAITÉ DE CHIMIE MINÉRALE. Edited by Prof. P. Pascal. Vol. III. Pp. xxi + 788. Paris: Masson et Cie, 1932. 140 fr.

The high standard set in previous volumes of this new French treatise on inorganic chemistry is fully maintained in the present volume and there is no doubt that the work has established its place as a worthy successor to the treatises of Friedel and of Moissan. The style and arrangement are clear and simple and the references both complete and up-to-date. The book can be read with pleasure, and all doubt as to the completeness of the references to the literature is easily set at rest by looking for recent English publications which might have been overlooked but are to be found in the numbered collections of references at the end of each section. The chapter on the nitrogen industry is probably the best account now available in any language, whether from the chemical, technical, or economic standpoint, and calls for special praise. The illustrations are clear and attractive and the copious collection of numerical data makes the work invaluable for reference. The combination of minute detail, exhaustive treatment yet attractive and readable style, with a clear and logical arrangement of the material, is in the best French tradition, and there is no doubt that the present large work will take its place besides Mellor, Friend, Abegg, and Gmelin in all chemical libraries. It is deserving of the highest praise. J. R. PARTINGTON

TRAITÉ DE CHIMIE MINÉRALE. Edited by Prof. P. Pascal. Vol. VII. Pp. xxiii + 643. Paris: Masson & Cie 1932. 120 fr.

This volume contains the following sections: Beryllium, by Mlle. G. Marchal; Magnesium, by C. Duval; Zinc, by P. Renaud; Cadmium, by D. Tombeck; Aluminium, by Mlle. S. Veil; Gallium and Indium, by J. Bardet and A. Tchakirian; Metallurgy of the Light Metals, by P. Baud: Hydraulic Binding Materials (Cements etc.), by E. Rengade; and The Glass Industry, by M. Samsoen. The sections on the metals follow a uniform plan somewhat similar to that of Newton Friend's well-known series of text-books, except that the physical and chemical data included under the individual compounds are rather more comprehensive, and a very extensive bibliography is provided at the end of every chapter on similar lines to those in Mellors' treatise. The chemical sections are, on the whole, very good; all the important and a fair number of the less important compounds are adequately described and their chief reactions discussed briefly. The metallurgical portions of the book are, however, much less complete, only comparatively brief outlines of the processes employed in the recovery of the metals from their ores being given, and no mention at all is made of the alloys; apparently this is reserved for a later volume. Practically no information is given of the industrial uses of the various compounds.

The section on hydraulic binding materials is a well-written account of all the modern types of cements and mortars with silicate and aluminate bases, but does not deal with oxychloride or dental cements. The chemistry of the various setting reactions is clearly explained, and the equilibria in the binary and ternary anhydrous systems is discussed. Methods of analysis are also included. The section on glass is not nearly so comprehensive as that on cements; the properties of glasses are briefly described and a short outline is given of the various methods of manufacturing certain types of glass articles.

The subject-matter is well arranged, and the book is well printed, although a number of misprints, chiefly in authors' names, have been noted. For a chemical work of reference it is reasonably priced. A. R. POWELL

CATALYTIC OXIDATION OF ORGANIC COMPOUNDS IN THE VAPOR PHASE. By L. F. Marek and D. A. Hahn, Ph.D. American Chemical Society Monograph Series. Pp. 486. New York: Chemical Catalog Co., 1932. $9.

This is an American Chemical Society monograph, being No. 61 in the series: it thus enters the chemical world under good auspices, albeit with a fiery torch. The flames even of the infernal regions cannot burn without oxygen, and nowadays the inquiring chemist is concerned to suspect the presence of a catalyst in every reaction. Though the earliest observations of catalytic behaviour had to do with oxygen, for some time the reactions of hydrogenation were most studied under the lead of Sabatier. Latterly oxidation reactions have come into the forefront of interest, and an immense amount of work has been done in connexion with the oxidation of simple aliphatic and aromatic substances in presence of a variety of catalysts: a good deal of this has received industrial application, so that manufactures involving carefully controlled oxidation in presence of catalysts are now becoming general in the chemical industry.

After a short general introduction on catalysis, successive chapters deal with the catalytic decomposition of alcohols, their oxidation to aldehydes and acids, and the reactions involved during that very complex process, their synthesis from water gas. Next follows the oxidation of methanol to formaldehyde, a chemical which is becoming more important as the synthetic resin industry increases. The oxidation of paraffin hydrocarbons, of olefins, and of petroleum fractions is discussed, also the production of hydrogen from methane, a reaction which may some day become of enormous importance on the North American continent.

Chapters are interposed dealing with surface combustion, a phase of oxidation of which the technical application has lagged behind expectations, and with the cause and suppression of knocking in internal-combustion engines, a subject which demands a book to itself, though it is here summarized in sixty-three pages. The final chapters are concerned with the oxidation of benzene, naphthalene, and anthracene.

Such is the scope of the book: it is written from the theoretical point of view, with full reference both to the scientific and to the patent literature. Any criticism in detail of such a work is impossible: it is primarily written for experts and will be found difficult reading by those who are not already well versed in this field. They, however, will find it of the utmost use, including as it does in small compass a large amount of matter which is scattered through the enormous literature of the day. Controlled oxidation can become a most valuable tool in the hands of man; uncontrolled it causes conflagrations and corrosions, the annual toll of which expressed in money values is very great. There is still a great work before the chemist to learn to control it. It is unfortunate that the price of the book is such as to put it quite beyond the reach of the English buyer. E. F. A.

DIE HOCHMOLEKULAREN ORGANISCHEN VERBINDUNGEN: *Kautschuk und Cellulose.* By Prof. H. Staudinger. Pp. xv + 540. Berlin: J. Springer, 1932. Paper, 49·60 rm.: bound, 52 rm.

There were, for a time, considerable difficulties in the way of applying the arithmetic of molecule and molecular weight to substances in which there was no constant molecule but at most a statistical average. Prof. Staudinger is a firm believer in real molecules and molecular weights and he teaches us in this book how to regard such "Hochmolakularen" substances as, in effect, ordered aggregates of homologous chains, the chemical properties of which are determined largely by the end groups and the physical properties largely by the lengths of the chains. This idea is in good accord with what is known of such substances as cellulose and caoutchouc, the two substances, mainly but not exclusively, dealt with in this book.

Prof. Staudinger and his co-workers at Zurich and Freiburg have since about 1920 issued a long string of papers setting forth the results of their studies on hochmolekularen substances, which have attracted great attention and acceptance: in this volume some 100 or more of these papers have been worked up, with other material, to form this most informing and stimulating volume which will bring these ideas in more accessible form, to the knowledge of yet wider circles of students.

It is indeed refreshing to find so eminent and thoroughgoing a champion of orthodox ideas of valencies and molecules dealing with vast numbers, half a million or more, as molecular weights and even those who themselves find some difficulty in going so far will pause to consider Prof. Standinger's evidence, and very likely accept it with renewed faith in the doctrines of their youth.

Recently Prof. Staudinger has done some most important work on the relation between viscosity and chain length, the conclusions of which do not altogether confirm conclusions reached earlier by other workers, employing earlier methods: it is already obvious that this viscosity method is going to be of increasing importance in determining chain length, and readers will turn, therefore, with special attention to Prof. Staudinger's views on viscosity, set forth with great clarity in this volume.

CHEMISCH-TECHNISCHE UNTERSUCHUNGSMETHODEN. Berl-Lunge. Edited by Dr. E. Berl. Vol. II, Part 2. 8th revised and enlarged ed. Pp. iv + 879—1795. Berlin: J. Springer, 1932. 69 rm.

This second part of volume II deals with the quantitative analysis of metals and alloys, and contains the indexes to the whole volume. The first two chapters are devoted to the sampling of ores, metals, intermediate products, and residues, and analytical and assay balances, respectively. Chapter 3 comprises an account of electrolytic methods of analysis with details of procedure in the case of each of the metals to which the methods are applicable. Subsequent chapters contain selected methods for the determination, in minerals, alloys, and other products, of all the metals likely to be encountered in industrial practice, including the rare earths: each is prefaced by a brief but adequate account of the occurrence and properties of the metal and its ores. The field covered by the book is wide, *e.g.*, in the section dealing with titanium the analysis of pigments containing titanium white is described and typical results for a series of commercial pigments are given, whilst the chapter on iron, which extends to 143 pages, deals not only with the analysis of special steels but also with the testing of moulding sand in respect of both chemical and physical properties. Each chapter is written by a specialist, and in practically all cases full references are given to the original papers. The type, illustrations, and binding are excellent, and the price is not excessive for so comprehensive a work. The volume is little less than indispensable on the analyst's or metallurgist's bookshelf. H. F. GILLBE

TEXT-BOOK OF PHYSICAL CHEMISTRY. By J. Newton Friend, D.Sc., Ph.D., F.I.C. Vol. I. General Properties of Elements and Compounds. Pp. xii + 501. London: Charles Griffin & Co., 1932. 24s.

This first volume deals almost exclusively with branches of physical chemistry that reflect little or nothing of recent developments in physics, in short with classical physical chemistry. One hundred and fifty pages are allotted to the general and statistical behaviour of gases, liquids, and solids, which seem rather many in view of the easy accessibility of most of the material. The section on macro-crystallography is splendidly illustrated, and there is an excellent account of the progress of atomic spectroscopy from the earliest times until just before the war. As a concession to recent advances, the parachor is given prominence, and also viscosity, although the only important chemical application of this subject, to the study of large molecules, is omitted. The classification of the elements appears, somewhat incongruously, between optical properties and solubility. It seems out of place in this volume since the interatomic relationships can only be adequately treated from the point of view of Stoner and Main Smith, and it is unnecessary to bother the present generation of students with contortionist Periodic Tables and questions such as "The Position of Hydrogen,"

which have *quite lost* their *significance*. Osmosis is given a chapter to itself and there are three dealing with phase-equilibria without mention of the Phase Rule. The early work of Langmuir forms the background for the discussion of adsorption, and the concluding chapter treats in a comprehensive though elementary manner of the colloid state.

The author set out to present physical chemistry as "a really human story," and in this he has succeeded, for the book is eminently readable. But to advanced students, a profusely descriptive and historical style makes less appeal nowadays than formerly, especially when contemporary chemistry is curtailed in order to make room for ancient physics or worse. It is rather melancholy, for example, to find on p. 52 Dunoyer's experiment with sodium vapour used to dispose of an absurd static theory of gases (credited to Sir Isaac Newton) while no mention is made of its important contributions to kinetic theory and other things in the skilful hands of Stern and his collaborators. May we not, in 1933, salute the Abbé Nollet (1748) and say farewell to him for ever?

It is inconceivable that Vol. II will have space to spare for the further elaboration of more than a few of these themes, since there still remain large and venerable subjects such as thermodynamics, electrochemistry, kinetics, and the theory of solutions, which have no place in Vol. I. Everywhere the writing is exceptionally clear. The bold print is agreeable to the eyes, and the diagrams are excellent. C. H. J.

THE MINERAL INDUSTRY OF THE BRITISH EMPIRE AND FOREIGN COUNTRIES: LITHIUM. Imperial Institute. Pp. 27. London: H.M. Stationery Office, 1932. 6d.

This booklet is a useful addition to the series of monographs prepared by the Imperial Institute on the mineral industry of the British Empire and foreign countries. Lithium has not so far been used industrially in any large amounts, and its annual production appears to be in the neighbourhood of 6000 tons a year. The variety of purposes to which it has been put shows however that it possesses properties which the industrialist cannot ignore. It has been shown to be a promising alloying element, especially for extra-light aluminium alloys used for constructional purposes, is useful for refining nickel and iron, is used to some extent in the glass industry, has an established place in the ceramic industry, and is employed for medicinal and other purposes. This booklet does not endeavour to deal with the metal in detail, but sketches its occurrence in lepidolite and lesser-known minerals, its preparation and uses, and its distribution in the British Empire and other parts of the world. At present the bulk of supplies comes from the United States, but the Empire possesses considerable resources. Canada in particular possesses rich deposits of lithium minerals which are awaiting development. The references to technical literature at the end of the booklet form a useful bibliography, with which those working on the metal would be able easily to review previous work or to determine the occurrence of lithium minerals in various parts of the world.

DIE LUFTSTICKSTOFF-INDUSTRIE MIT BERÜCKSICHTIGUNG DER CHILENISCHEN INDUSTRIE UND DES KOKEREISTICKSTOFFS. By Dr.-Ing. B. Waeser. 2nd revised ed. Pp. viii + 509. Leipzig: O. Spamer, 1932. Paper, 30 rm.; bound, 33 rm.

This is a second edition, the first, issued at the end of 1922, having been translated into English by Dr. Fyleman in 1926. There is ten years' progress to chronicle, as well as a dramatic change in the economic position of the industry, which has passed from prosperity to poverty largely as the result of unrestricted competition and over-production. The author tells us he has studied some 8500 new publications, including patents, which have appeared during the ten years: this we may regard as a measure, if not precisely of the technical progress, of the amount of interest which has been displayed in the subject.

The book is divided into two parts, which occupy about two-fifths and three-fifths of the total pages. The first deals with the nitrogen industries of the various countries of the world, conveniently separated into sections, and the second is occupied with a description of the technical processes. These are to-day the Haber-Bosch, Claude, Casale, Fauser, Nitrogen Engineering Corporation, and the Mont Cenis. A description is also given of the cyanamide, nitride, and cyanide processes. The book is full of information and interest to those associated with this important section of chemical industry. English readers will view with pride the important position taken by Great Britain as a producer during the last decade, and they will be concerned also with the world-wide development of the industry. At one time it seemed profitable to fix nitrogen only in large units, but the present tendency is to make an economic installation out of far smaller units. Here, as elsewhere, there is need on the one hand to introduce sanity into the craze for excessive production, and on the other to encourage the old and find new uses for the product: to do this needs, above all, the agriculture of the world to return to prosperity. E. F. A.

ALUMINIUMCHLORID IN DER ORGANISCHEN CHEMIE. By G. Kränzlein. 2nd revised and enlarged edition. Pp. 143. Berlin: Verlag Chemie, 1932. 12 m.

The first edition of this book—a pamphlet some forty-seven pages in length—was the outcome of a lecture delivered by the author at Frankfurt in June, 1930, before the Verein Deutscher Chemiker, the subject matter, or to be more precise, the actual manuscript of this lecture serving as the basis of publication, with the inevitable result that much information was condensed into little space, leaving the reader with the impression of a concise summary rather than a comprehensive survey of the application of this valuable reagent. The importance and variety of uses of aluminium chloride are such that they undoubtedly merit fuller treatment, and this has been adequately accorded to them in the new edition. There is first of all the noteworthy addition of an introductory chapter on the preparation of anhydrous aluminium chloride. Next comes a consideration of its mode of action, followed in turn by examples of the more generally known types of condensations which its presence renders

possible. This section is completed by the mention of the direct introduction of oxygen into the aromatic nucleus, and by the inclusion of methods of preparation of *heterocyclic compounds* containing phosphorus, sulphur, selenium, or arsenic. Subsequent chapters deal with other phases of the problem which lead to compounds of still greater complexity. There are those reactions which merely involve a rearrangement of the groupings in the original molecule. Other syntheses necessitate dehydration, an addition reaction at a double bond, or the loss of the elements of water, while with suitable reactants there is the simultaneous occurrence of two such processes.

The author makes brief reference to the introduction of halogens and nitro groups into the aromatic nucleus, before passing on to the remaining aspect of his subject, the removal of a group or groups from a compound and consequent diminution of its complexity, this bringing him to the consideration of that important problem the cracking of mineral oils. He concludes his monograph with a short chapter devoted to the various technical applications of the use of aluminium chloride in organic syntheses. The value of the book as a work of reference is enhanced by the inclusion of complete subject and author indexes.

J. STEWART

VON DAVY UND DÖBEREINER BIS DEACON, EIN HALBES JAHRHUNDERT GRENZFLÄCHENKATALYSE. By A. Mittasch and E. Theis. Pp. viii + 278. Berlin: Verlag Chemie. 1932. 18.50 m.

The authors of the above book have succeeded in producing a very readable and human account of the early history of catalysis, woven around the names, above all, of Davy, Döbereiner, Faraday, and Mitscherlich. Although certain catalytic reactions, notably the chamber process for the production of sulphuric acid, and the preparation of ether from alcohol, can be traced certainly into the eighteenth, and even into the seventeenth, centuries, the discovery by Davy of the flameless combustion of inflammable gases on the surface of platinum laid the foundations for the almost immediate recognition of many of the fundamental principles of contact catalysis. Döbereiner, who, from being an *out-of-work apothecary, became the friend and chemical* adviser of Goethe and professor of chemistry at Jena, captured the current popular scientific imagination with his ignition of knall-gas by platinum at the ordinary temperature. Faraday, investigating the action of poisons on catalysis and expressing views strikingly in accordance with modern theories: Berzelius, who defined catalysis as "combination or decomposition by contact": Liebig, with his opposition of Berzelius' conception of catalytic power—all these pass across the stage during the first four decades or so of the past century, and, in passing, throw forward shadows which reach to the present day.

An interesting variation of the theme is the arrangement of later sections of the volume around processes rather than around individuals. The work of Phillips and his successors, which culminated in the sulphuric acid contact process, and the genesis of ammonia oxidation at stages long before Ostwald's recognition of the conditions for commercial yields, are in each case dealt with in fair and undistorted perspective. The book, which is illustrated with sixteen plates, in addition to text illustrations, is certainly to be recommended to the many who find pleasure and profit in the study of the beginnings of things.

E. B. MAXTED

CHEMICAL ANALYSIS BY *X*-RAYS AND ITS APPLICATIONS. By G. von Hevesy. The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University. Vol. 10. Pp. 333. London: McGraw-Hill Publishing Co., 1932. 18s.

Attention was first drawn to the value of *X*-ray spectroscopy as a method of chemical research when the new element Hafnium was discovered by *X*-ray analysis in minerals which had already been investigated by other methods, including optical spectroscopy, without success. *A treatise on chemical analysis by X-rays by Prof.* Hevesy, one of the two joint discoverers of Hafnium, naturally arouses expectations. A careful reading of the volume shows that these expectations are fully justified, Prof. Hevesy has produced a treatise which is packed with practical hints and invaluable detailed information. Even in his early researches on the separation of Hafnium from its ores we find that Prof. Hevesy was using *X*-ray analysis not merely as a qualitative but also as a quantitative method of analysis, and since that date methods for exact quantitative analysis, particularly of complicated rare earth minerals, by *X*-rays have been worked out in detail, largely in Prof. Hevesy's own laboratory. The method in brief consists in photographing the *X*-ray spectrum of a mixture of the given substance with a known proportion of some suitable standard substance, and determining the relative intensities of the various *X*-ray lines observed. To translate these intensities into proportions by weight necessitates a very thorough knowledge of the natural intensities of the different lines in the *X*-ray spectrum, and of the disturbing effects of various factors on these intensities. Prof. Hevesy deals very fully with all these points, and adds to our indebtedness by including complete tabular information which will be invaluable to anyone engaging in similar work. These tables alone would be sufficient to make the book an indispensable laboratory companion to any worker in this new and promising field. The book is a record of a series of lectures given at Cornell University under the George Fisher Baker Foundation, and suffers somewhat from the fact that it was planned as a lecture course and not as a treatise. Something like half the book is occupied with subjects such as the Age of the Earth, the Chemical Composition of the Earth, and the Physical and Optical Properties of Hafnium, which, though interesting in themselves, are somewhat remotely connected with the subject which gives the book its title. These subsidiary lectures are ably and authoritatively written, and readers of CHEMISTRY AND INDUSTRY may be glad to know of their existence in a volume in which, from its title, they would hardly have thought to search for information of this kind.

J. A. CROWTHER

QUANTITATIVE ANALYSIS. By E. G. Mahin, Ph.D. 4th ed. International Chemical Series. Edited by J. F. Norris, Ph.D. Pp. xiii + 623. London: McGraw-Hill Publishing Co., 1932. 24s.

It is a well-established fact that many students of chemistry fail to appreciate the close connexion that exists between the laboratory and the lecture theatre. Time and time again they carry out this and that operation *secundum artem* but, unfortunately, without having any clear idea of the underlying principles. Prof. Mahin, being a professor of analytical chemistry and therefore well aware of the gap which often exists between the class-room and the laboratory, has spared no effort to expound the principles upon which quantitative analysis is based; at the same time he has avoided elaborate and involved discussions, and this new edition of his book is very welcome. Although the present work has not been entirely rewritten, it has been thoroughly revised and brought up to date, so that it not only retains most of the excellent features of the earlier editions but is enriched by the addition of new matter, including a chapter on hydrogen ion concentration and electrometric titrations, whilst the discussion on the analysis of steel, water, and oils, and the chapter on indicators has been amplified. As Prof. Mahin points out in the preface, since the subject of physical metallurgy has become a highly specialized field of study, metallography is no longer a mere adjunct to courses in chemistry, and therefore the section dealing with the metallography of steel has been eliminated from this edition.

The book is divided into three parts—general quantitative analysis, special measurements, and analysis of industrial products and raw materials. Part I, opening with a short account of general principles, deals with gravimetric, volumetric, and electro-analysis, indicators, oxidation and reduction, and titrations involving the formation of precipitates. In Part II, density and specific gravity, heat of combustion, index of refraction, optical rotation, and hydrogen ion concentration are discussed, whilst Part III is devoted to the analysis of rock, cement, fuels, oils, fats, waxes, water, steel, alloys, fertilizers, foodstuffs, and to the assay of gold and silver ores. Although, as the author himself remarks, this book cannot be classed as a complete reference work, it is certainly not a bare outline of laboratory exercises but rather an inspiring guide to the study of quantitative analysis. W. H. B.

WÖRTERBUCH DER KOLLOIDCHEMIE. By Dr. A. Kuhn. Pp. 179. Dresden and Leipzig. T. Steinkopff, 1932. 8 rm.

One of the difficulties which has to be faced by those whose interests enter the domain of colloids is that of learning a great number of new terms in which new ideas are expressed. A colloid-chemical dictionary is of value therefore to scientific investigators in numerous fields. Such a work has a further beneficial influence in tending to stabilise the terms in vogue and to check the multiplicity of terms denoting the same thing. To regard the present work as a dictionary, however, would be to give it but scant justice. It is more than a dictionary; it is a pocket encyclopædia. Apart from the valuable treatment of the more abstract colloid-chemical nomenclature, the book contains details of the preparation and properties of a large number of colloids, and in many cases recent data are given in the form of tables or graphs. The 47 illustrations also include several diagrams of special apparatus, and references to the original literature are given in a few cases. The technological side is treated only briefly, although reference is made to some of the more important materials, such as cellulose, caoutchouc, etc. The book will be a most useful work of reference not only to colloid chemists and technologists but also to investigators in biology, medicine, geology, and allied sciences. It should be included in all scientific libraries.

E. S. HEDGES

HANDBUCH DER BIOLOGISCHEN ARBEITSMETHODEN. Edited by Prof. E. Abderhalden. Katalytisch-organische Arbeitsmethoden. By M. Frankel. Abt. I, Chemische Methoden, Teil 12, Heft I. Lieferung 380. Pp. 176. Heft II. Lieferung 382. Pp. 177—336. Heft III. Lieferung 385. Pp. 337—510. Berlin: Urban & Schwarzenberg, 1932. Lieferungs 380, 10 rm.; 382, 8.50 rm.: 385, 10.50 rm.

The conception of catalysis, which is not so very old in point of years, has had far-reaching effects both in the interpretation of biological phenomena and in its application to chemical reactions, in the laboratory as well as in industry. In the practical technique of organic chemistry in particular the use of catalysts has been found to have an ever-widening scope, and therefore it is not in any way surprising to have a special section of considerable length devoted to the subject in Abderhalden's all-embracing handbook of biological experimental methods. The author, Dr. Frankel, has undertaken a task of considerable magnitude in attempting to sort some kind of plan and order out of the vast bulk of experimental papers relating to the subject. The book is in the main of the dictionary type, and its utility to the research worker depends largely on the ease with which he can refer to the particular information he is seeking, and therefore to some extent on the list of contents and index. The scope of the work may be best indicated by referring to the former.

It begins necessarily with a short introductory section of a general character, followed by the special parts. These deal with hydrogenation at some length in all its phases, listing the addition of hydrogen to compounds of a wide variety of type in the gas phase: the description includes that of the preparation of the catalyst and of the necessary laboratory apparatus. It is extended to hydrogenation under reduced as also under increased pressure, as well as that in the liquid phase, including the use of the metals of the platinum group in the colloidal state. This section takes up some two-fifths of the book. Dehydration is described in the same thorough manner, followed by oxidation, using a variety of oxidizing agents. Next come the reactions involving addition to unsaturated compounds, particularly of water, and then those involving the reverse operation, namely, the elimination of water. In the next section the elimination of halogen hydride by the Friedel-Croft and similar reactions is considered.

Lastly come the changes comprised under the headings of isomerization and polymerization.

The work is thorough, conscientious, and complete in the manner which we have grown to expect of all the Abderhalden text-books; a good deal more consideration is given to the non-German literature than at one time used to be the case with German books. This is essential nowadays, when the one-time German supremacy has passed, and the original worker looks very largely to British and American literature for his inspiration. In relation to the information available the price is relatively moderate, and the book will probably be found of great use in most research laboratories.

HANDBUCH DER BIOLOGISCHEN ARBEITSMETHODEN. Edited by Prof. E. Abderhalden. Die Methoden der Dien-synthese. By K. Alder. Abt. I, Chemische Methoden, Teil 2, 2. Hälfte, Heft 9 (Schluss). Lieferung 400. Pp. 3079—3291. Berlin: Urban & Schwarzenberg, 1933. 13.50 rm.

According to the well-known theory of Thiele, a symmetrically constituted diene of the form $\overset{1}{C} = \overset{2}{C} - \overset{3}{C} = \overset{4}{C}$ yields 1,4-addition, owing to the possession of free affinity by carbon atoms 1 and 4, thus: $C \cdot C - C \cdot C \rightarrow CX - C = C - CX$. Although there are many exceptions to this generalization, the special type of 1,4-addition discussed in the present treatise takes place with such certainty that it has become a valuable diagnostic adjunct and synthetic principle. The so-called diene synthesis has emerged as a result of extensive investigations conducted by Diels and Alder since 1926.

The course of events in the diene synthesis may be formulated in general terms as follows: (*a*) Compounds containing a system of conjugated double bonds yield 1,4-addition with compounds containing an active ethylene or acetylene linking, thereby giving rise to a partly hydrogenated six-membered ring-system: (*b*) the activation of the ethylene or acetylene linking is brought about by means of an unsaturated group ($>C=O$, $-C\equiv N$, $>C=C<$, and possibly $-NO_2$) situated in the $\alpha\beta$-position. The author gives a systematic review of important substances, falling under the two heads, which have been found to conform to the above principle, and practical conditions are also discussed.

Of the many interesting applications of the diene synthesis, it must suffice to quote a few representative examples. A notable synthesis is that of β-irone, the natural violet ketone which was isolated by Tiemann and Krüger in a yield of less than 0·007% from violet roots. The very complicated and laborious synthesis of this ketone by Merling and Welde stands in marked contrast to the facile two-stage diene synthesis from 1,1-dimethylbutadiene and crotonic aldehyde. Equally attractive and impressive are the syntheses of *nor*-camphor (*i.e.*, the fundamental cyclic ketone of which camphor is the trimethyl-derivative), and, through this, of camphene, from *cyclo*pentadiene and acrolein.

The principle of diene synthesis applies not only to acyclic and homocyclic dienes, but also to heterocyclic systems with oxygen in the ring, such as furan and coumalin. Addition occurs also in the case of nitrogeno rings, but in such instances the reaction follows anotl course, which it would take too long to discuss in tl place.

It is difficult in a short review to do justice to I Alder's able summary and exposition of these importa original researches in which he has taken so active part, but perhaps enough has been said to show th organic chemists and biochemists alike will derive mu profit from a study of this many-sided diagnostic a synthetic method. The variety of syntheses to whi it affords an opening is astonishing, and the elaborati of some of the molecular patterns—particularly t polycyclic ones—provide exercises in molecular che surpassing in interest even the problems of the mac scopic game.

JOHN READ

SULPHUR BACTERIA. By D. Ellis, D.Sc., Ph.D. Pp. ix · 261. London: Longmans, Green & Co., 1932. 21

The bacteria which oxidize sulphur and its compoun are of great interest and importance from both morph logical and physiological points of view. The bi chemistry of sulphur oxidation and the suppose photosynthetic activity possessed by those bacter that contain purple pigment offer fields of researc which promise important advances in our unde standing of the physiology of living matter, while the purple bacteria display a most interesting examp of phototropism. Sulphur bacteria have also a co siderable practical importance in soil bacteriolog and in connexion with water supply. They ma have a bearing on the acute problem of the decay stone.

The group contains widely diverse morphologic types, and the common ground possessed by the would appear to be physiological. Yet the autho defines "sulphur bacteria" as bacteria which hav sulphur globules in their cells, and he excludes fro the main part of the book an important group for th reason that, in their case, "the sulphur accumulate outside the cells. This appears insufficient ground fc the exclusion of this group, especially since the autho says that with his true sulphur bacteria "the sulphu appears to be excreted and oxidized to sulphate out side the cell." The group which he thus exclude contains the organism *Thiobacillus thiooxidans*, althoug he includes other species of the same genus *Thiobacillu* in his classification of the true sulphur bacteria.

A large part of the book deals with the morphologica description of known types of sulphur-containin bacteria, but in many cases the descriptions of th organisms are too incomplete to warrant the creatio of specific names.

The author rightly draws attention to the opportunit offered by some of the large-celled sulphur organism for the investigation of bacterial cytology and of th vexed problem of the methods of reproduction amongs bacteria. The value of observations made in thes subjects is entirely dependent on the technique em ployed, so that the inadequate description of thi technique renders the value of the author's conclusion difficult to assess. There are interesting sections o the phototropism of the coloured bacteria and upo

the absorption spectra of their pigments. The book contains some statements which might be more accurately expressed: the reader will receive a slight shock when he reads on page 8 that "the energy of the universe is derived from green plants (and a small number of minute animals)." The formula for the medium given on page 220 appears to require checking.

H. G. THORNTON

NEW CONCEPTIONS IN BIOCHEMISTRY. By N. R. Dhar, D.Sc., M.Sc. Pp. x + 168. Allahabad, India: Indian Drug House, 1932.

The contents of this volume justify the title, for Prof. Dhar, in a course of lectures at Patna University from which the book is derived, has advanced views which are in many respects novel and unorthodox. A vast range of subjects is covered, and whether the author is considering cancer or ketosis, gout or gallstones, he is never at a loss for a plausible hypothesis that will provide a physico-chemical explanation of the biological phenomena. Prof. Dhar is particularly attracted by the possibility of applying knowledge of "induced oxidations," to which he has contributed so much, to the reactions occurring in living tissues. It is to be regretted that the book shows a serious lack of balance between what may be termed the chemical and the biological presentation. The author has drawn references from a wide field of biochemical and medical literature, but his treatment of the material shows that his appreciation of the "biologieal point of view" is often faulty, and that his perspective is frequently poor. In spite of these faults the book is amusing and stimulating to read. J. C. D.

LA CULTURE DES TISSUES. By B. Ephrussi. Collection des Actualités Biologiques. Under the direction of R. Levy. Pp. viii + 233. Paris: Gauthier-Villars & Co., 1932. 45 fr.

In spite of the great advances made during the past few decades in the biological sciences, surprisingly little is known concerning the very fundamental problem of the nature of growth. The nature of the stimuli which cause a living cell to divide and the factors which determine when a particular tissue shall stop growing are little understood. The view is held by many biologists that only by reaching a fuller understanding of the factors involved in normal tissue growth shall we reach a position from which we can grapple with the problem of the factors which lead to abnormal cell proliferation as seen in the growth of tumours.

The fascinating technique of the culture of living tissues *in vitro* which has during recent years been largely developed by Carrell, Fischer, and others, has placed in the hands of the biologist a powerful new weapon with which to attack the problem from a new direction. With its aid it is being found possible to study in a quantitative manner cell division and the factors causing its stimulation or inhibition. The monograph is an extremely well-written and comprehensive account of all the most important work in this field up to the present day. The two opening chapters give a clear and detailed account of the general principles and methods of the highly specialized technique of tissue culture. The text is illustrated by a large number of excellently reproduced plates, figures, and diagrams, whilst the value of this book is considerably enhanced by the bibliography of nearly 250 references. It is naturally too specialized a book to appeal to the general scientific reader, but one which should undoubtedly find a prominent place in the bookshelves of all biologists, and particularly those working in the same field as M. Ephrussi. It is a matter calling for comment that such a comprehensive and splendidly produced monograph can be published at the comparatively low figure of 45 f.

G. F. MARRIAN

FORTSCHRITTE DER BIOCHEMIE. II. TEIL (1924—1931). By Prof. Dr. F. Haurowitz. Wissenschaftliche Forschungsberichte Naturwissenschaftliche Reihe. Edited by Dr. R. E. Liesegang. Vol. XXVI. Pp. x + 155. Dresden and Leipzig: T. Steinkopf, 1932. Paper, 11 rm.; bound, 12 rm.

The knowledge of biochemistry advances so rapidly and in so many different fields that it is only with the help of summaries that contact can be maintained with the progress of the subject as a whole. The one before us deals with the period 1924—1931, and is a sequel to a similar summary published in 1925. It is divided into eighteen sections, which cover a wide field: enzymes, the constitution of the carbohydrates, glycogen, the chemistry of muscular contraction, proteins, nucleic acids, the colouring matters of blood, immunity reactions are among them. Further subjects discussed are the fats, phosphatides and cerebrosides, carotene, hormones, and of course the vitamins. So fast is progress in these fields that the older readers will find themselves confronted with a mass of new facts and new theories, from among which there is beginning to emerge clarity.

As an analyst the biochemist has very nearly completed his task—relatively few substances remain of which we cannot at least guess at their structure, though of course much remains to be done. Starch and cellulose, carotene, and chlorophyll are examples of the progress made. There is much yet for synthesis to achieve, and always room for more accurate experimental methods. We have yet to grasp many substances as they exist *in vivo*, for it is probable that the mere act of killing and extraction produces changes which mean that the compounds isolated have already undergone modification.

The sugars are always to the forefront in interest. At long last the structure of the disaccharides, and to a great extent also of starch and cellulose and the polysaccharides in general, has been solved, so that a long and difficult chapter in their investigation appears to be closing. At the same time a new and immensely important one is commencing which has relation to the part played by specific polysaccharides in immunology. The extraordinary specific character of the precipitin reaction has long excited interest; there is now more than a hint that it is based on stereochemical differences among the sugars. The rôle of phosphorus in life becomes

daily more evident, in fermentation, in muscle reactions, in bone formation, in phosphatides.

To have even a general knowledge of all these sections of our subject has become difficult without such help as Dr Hourowitz provides at a price which puts it in the reach of everyone: this is a commendable departure from recent German practice. The book is clearly set up, with sufficient formulæ and easy reading, when allowance is made for the complexity of the subject.

E. F. A.

EXPERIMENTAL COOKERY. FROM THE CHEMICAL AND PHYSICAL STANDPOINT. By B. Lowe. Pp. xi + 498. New York: J. Wiley & Sons; London: Chapman & Hall, 1932. 28s.

The principal function of this book as stated by the author is "to present our newer knowledge of food preparation and cookery processes from a chemical and physical basis, particularly that of colloidal chemistry." In most attempts which have been made to deal with the scientific foundations of cookery the tendency has been to concentrate attention mainly on biological structure, chemical composition and the nature of the chemical reactions taking place, and this survey of the processes involved in the preparation and cookery of food from the standpoint of applied colloidal chemistry forms a very valuable contribution to the all too meagre literature of the subject.

The first chapter gives an outline and explanation of colloidal chemistry in its relation to cookery, and this is followed by chapters dealing, in turn, with the principal foods and also with the subjects of freezing, emulsions, and jelly. The author adopts an impartial attitude and presents the subject matter in the form of necessary explanations of fundamental processes together with a review of the available information and a summary of observations of different workers. A comprehensive list of references and details for suggested practical work are given at the end of each chapter. It would appear to be the intention of the author that the book should be used for reference and also in the laboratory, though the size and price of the book are likely to limit its use for the latter purpose. In explaining the meaning of the term "inversion" an unfortunate misprint (p. 30) which gives rise to the statement that sucrose is levorotary is likely to cause some confusion to the uninitiated.

H. M.

SIGNIFICANCE OF PHOSPHORIC ESTERS IN METABOLISM. By R. Robison, Ph.D., D.Sc., F.R.S. Pp. ix + 104. New York: The New York University Press; London: H. Milford, Oxford University Press, 1932. 11s. 6d.

The importance of phosphorus in the living system becomes increasingly obvious, but it is probably not an exaggeration to say that as yet the exact rôle it plays is not really understood. Prof. Robison has contributed so largely to the development of the subject that any publication of his views must be regarded as important. This book is the publication of three lectures delivered by the author in New York in 1931: they have obviously been carefully rewritten and brought up to date.

The first lecture deals with the occurrence of phosphoric esters in nature and is a brief but comprehensive review of the work of Harden and his school on the hexose phosphates of yeast fermentation and a still briefer summary of the work of Meyerhof, Embden, Lohmann, and others on muscle hexose phosphates. The phosphopipins, nucleic acids, and phosphagen receive only a passing mention.

The more interesting parts of the book are the remaining two lectures, entitled respectively "Calcification of Cartilage and Bone" and "Calcification *in Vitro*." The first of these is also in effect a review of earlier literature, but is not, like so many reviews, a disjointed summary of isolated facts and names. The discovery and properties of the enzyme phosphatase are discussed in relation to the author's scheme of bone formation. The third chapter is devoted to the work of the author and his co-workers on the growth of the bones of rachitic animals *in vitro* in various phosphate ester solutions, and is illustrated by plates showing the histological changes produced in the growing bone by the various treatments.

The whole book is clearly and simply written. Even if it were not the only recent book on the subject it could be recommended, but as such it should be read by all biochemical workers and students.

L. M. M.

BIBBY'S BOOK ON MILK. Section I. Supplement No. 2. The Appeal to Cows and Minimum Variation in *Quality of Milk and What is Normal Milk?* 1925—1931. Pp. 46. Liverpool: J. Bibby & Sons. 4s.

Bibby's Book on Milk was an outcome of the testing of farmers' milk, in which many figures were collected, to assist this firm of foodstuff manufacturers in answering their customers' questions. Later the collected information was published as a book. This present supplement of 46 pages possesses a peculiar interest because it challenges certain beliefs generally accepted amongst public analysts who devote much of their professional time to milk analysis. There is a section on the value of the appeal to the cow which emphasizes, amongst other things, the importance of the appeal being prompt. An account of the minimum variation in the quality of genuine milk contains the conclusion that "the chances of milk below standard being produced by a herd of five cows are never a remote probability." Some interesting figures are given showing the degree of accuracy to be expected from the various figures obtained in milk analysis. The author concludes that the refraction as determined by an immersion refractometer is the most constant of the properties of milk from one source. The author's contention that the refractometric test is superior to those more usually employed was the target of some very pointed criticism in this JOURNAL, by Elsdon and Stubbs (J.S.C.I., 1928, **47**, 1145, CHEMISTRY AND INDUSTRY). In this supplement the author appears to have set out to show that most of these arrows failed to hit their mark.

A. W. K.

INTERNATIONAL HANDBOOK OF THE BY-PRODUCT COKING INDUSTRY. By Prof. Dr. W. Gluud. English edition by E. M. Myers. Pp. xii + 879. Halle (Saale): W. Knapp; London: E. Benn. 1932. £4 4s.

When the history of the first half of the twentieth century comes to be critically reviewed one of its outstanding features will be seen to have been the final realization of the necessity for both thinking and acting internationally. The work under review is a notable example of international effort. Based on the original German edition, it was translated into English by Dr. A. Thau and revised and supplemented by the late D. L. Jacobson to give due consideration to American practice. The American manuscript has been further supplemented by E. M. Myers with particulars relevant to British practice, and it comes to us finally in the form of an English edition. The general plan of the original German edition, which was reviewed in this JOURNAL (1929, **48**, 458), remains unchanged, except that the two volumes are now published as one.

The Scientific Section is rightly, in a work of an essentially practical nature, subordinated to the Technical Section. Nevertheless it compresses into its allotted space a great deal of valuable information regarding the origin, natural distribution, composition, classification, and analysis of coal, as well as its properties of swelling, weathering, and spontaneous ignition, and its general behaviour on destructive distillation. By the man engaged in the practical processing of coal such particulars regarding his raw material will be warmly welcomed. The presentation of the material is, on the whole, admirable, if not entirely above criticism. For example, one looks in vain for some mention of Seyler's well-known work on coal classification, or for any reference to the standard methods for the analysis of coal drawn up by the British Standards Institution. One wonders why the familiar Gray–King carbonization test is described anonymously, and why no mention is made of the difference in manipulative detail between operating and the test at 600° and 900°.

The Technical Section begins with a consideration of coal cleaning, an operation of the utmost importance to the coke producer, although he may not always control it. The material is rather lacking in balance and contains no account at all of dry cleaning processes. The coke oven appears nearer to the authors' hearts and their chapter on its development from earliest types up to the present day is thorough, informative, and lavishly illustrated, in fact altogether excellent. The previous criticism in our review of the original German work of a certain one-sidedness no longer applies, the matter being handled from a truly international standpoint. The same is not equally true of the chapter on coke, which, although including a valuable summary of work relating to reactivity and combustibility, those old and very tough bones of contention, omits completely any account of the investigations of our British Coke Research Committees into this and allied subjects, *e.g.*, Shatter Test. No reference is made to domestic uses of coke nor to methods of cutting and grading coke for special purposes, a regrettable omission at a time when new outlets for high-temperature coke are being actively explored.

The chapters that follow deal with coke-oven gas. Processes for the removal of hydrocyanic acid and hydrogen sulphide and for the recovery of ammonia and benzole are very fully described and, apart from a few omissions (*e.g.*, dephenolation of waste liquors by activated carbon, and the Instill process of benzole refining) the handling and presentation of the large amount of valuable material calls for our admiration. One only regrets that an account of modern developments in long-distance transmission of coke-oven gas for domestic and industrial uses has not been included in the picture.

A work of the magnitude and scope of the "International Handbook" cannot be expected, in its first edition, to be entirely free from omissions, and it must not be supposed that such as we have mentioned, important though they are, can to any serious degree detract from the outstanding achievement of all concerned in its compilation. We have no hesitation in predicting that it will undoubtedly be hailed in all countries as the standard work of reference in this great and important industry. W. T. K. BRAUNHOLTZ

MEASUREMENT OF THE VISCOSITY OF COAL-TARS AND PITCHES. By H. Pickard. South Metropolitan Gas Company, Chemical Department. Pp. 57. London: South Metropolitan Gas Co., 1932.

This recent publication is complementary to an account of work which was published by the same company a year or so ago on "An Investigation into the Nature and Properties of Coal-Tar," when results were given concerning the general relation between temperature and consistency of tars and bituminous binders. Two instruments used in the work, the Metro-Trough Viscometer and the Metro-Plastimeter, were also described. The present booklet of 57 pages deals essentially with the relationship between the results obtained with those instruments and with absolute viscometers, or, in other words, the relationship between consistency and viscosity.

The work is divided into two parts dealing respectively with "The Measurement of the Viscosity of Coal-Tars" and "The Measurement of the Viscosity of Pitch." In order to determine the viscosity of tars two different instruments were selected—(*a*) a capillary tube type of viscometer and (*b*) a rotating cylinder type viscometer, both of which are illustrated. Numerous tables and graphs of results with different materials are given, while five different technical viscometers were compared with the rotating cylinder instrument.

The second portion of the booklet describes and illustrates a modification of the twisting cylinder viscometer of Trouton and Andrews. Results for different pitches are given and the conclusions summarized. Comparison of results of penetration tests of pitch by the Metro-Plastimeter and those obtained from an absolute viscometer revealed a linear logarithmic relationship, while the temperature-consistency curves were also practically identical by the Trough Viscometer and the Plastimeter. Altogether it is a very useful piece of work which should assist those dealing with such problems. There is nothing to indicate that the publication may be purchased. A. MARSDEN

CALCULATION OF HEAT TRANSMISSION. By M. Fishenden, D.Sc., and O. A. Saunders, M.A., M.Sc. Pp. xii + 280. H.M. Stationery Office, 1932. 10s.

Heat transmission is of great industrial importance, since a very large percentage of the energy used in industry is developed in the first instance as heat and then changed to the form desired. Many problems relating to heat transfer have been solved and plants designed largely by the use of empirical formulæ which have been derived from practical experience. To enable *the engineer to advance beyond the limitations imposed* by such experience without running the risk of failure, a sound knowledge of the fundamental methods by which heat can be transferred becomes essential. With this object in view the authors have devoted three chapters to the transference of heat by radiation, two chapters to the movement of heat by conduction, and three chapters to the conveyance of heat by convection, whilst the last chapter is devoted to calculations on heat transmission. Many interesting everyday facts are carefully explained in these chapters, and serve to illustrate those points which the authors desire to emphasize.

The results of the work of many experimenters in this subject have been carefully studied, and in Appendix A the principle of similarity, which has been extensively used in the preceding chapters to correlate the results, is discussed in detail, whilst Appendix B is devoted to proofs of the formulæ relating to parallel and counter-current flow. The final Appendix C consists of tables relating to the physical constants for gases and water at different temperatures, and this is followed by a bibliography in which full reference is made to 198 papers which have appeared on this subject.

The book is well printed and illustrated and contains much valuable information. It will be of the greatest use to those engaged in solving problems of heat transmission.

GAS CALORIMETRY. By Major C. G. Hyde and F. E. Mills, B.Sc. Introduction by Prof. C. V. Boys, LL.D., F.R.S. Pp. xvi + 376. London: E. Benn, Ltd., 1932. 42s.

The introduction of the Gas Regulation Act of 1920 under which gas is sold by its heating value in therms rather than by volume has naturally caused the subject of gas calorimetry to assume a far greater importance than was previously the case. The present work is therefore not only welcome and timely but is of particular value, because over twenty years have elapsed since the book by J. H. Coste on "The Calorific Power of Gas" appeared. Since that time enormous strides have been made in connexion with both apparatus and methods, and the increasingly important branch recording gas calorimetry has come into being. The authors constitute a combination peculiarly well fitted for their task of dealing with the technique of gas calorimetry from all points of view, and the treatise is not only able and exhaustive but, as pointed out by Prof. Boys in his introduction and confirmed by reading, may be taken as authoritative. Since some £50,000,000 is spent annually in this country on gas the importance of testing is obvious, and Prof. Boys emphasizes the fact that "no single commodity generally purchased by the public is so carefully watched and maintained of its guaranteed quality as gas." The book is divided into 17 chapters, each dealing with some important aspect of the problem. After a general introduction there is a chapter on accommodation and equipment, followed by one on water-flow calorimetry. Then follows gas measurement with particulars of the Boys and Hyde types of wet meter; there are also details of gas volume correction. The Fortin type of barometer is described at length, although the latest method of viewing the fiducial point through an optical system is not mentioned.

Water supply and measurement are dealt with in chapter 5, after which is a very useful treatment of thermometric measurement. The various types of water-flow calorimeters are then described, while in chapter 8 is discussed the B.Th.U. effect of possible errors in water-flow calorimetry. Chapters 9 and 10 are very important and deal respectively with recording calorimetry and types of recording calorimeters. The general notification of the Gas Referees relating to recording calorimeters is also included. In chapter 11 still-water calorimeters, including the bomb, are discussed, while in chapter 12 explosion instruments such as the Strache and Löffler receive treatment. The reviewer finds it a little difficult to subscribe to the authors' view that such instruments yield remarkably consistent results. There follow chapters on indicating calorimeters, the calculation of calorific value from composition, the partial drying of gas and its effect on calorific value determinations and lastly, the control of calorific value.

Apart from its general value to the gas industry, the book will be of great value to gas examiners, to the officials of gas undertakings who are responsible for the actual testing of gas, and to students, although some of the latter may wish that calorimetry for works control purposes and applied to gas in various stages of manufacture had received treatment. There are 30 tables distributed through the book, while a good appendix contains 14 more, including an extended table of logarithms of gas volume factors. Some of these tables will be in constant demand and may well be issued as a small separate publication. The printing, illustrations, and general production are good, although the price may exclude from the circle of purchasers many to whom the book would be very useful.

ARTHUR MARSDEN

UNIT PROCESSES AND PRINCIPLES OF CHEMICAL ENGINEERING. By J. C. Olsen, Ph.D., D.Sc., and others. Pp. xiv + 558. London: Macmillan & Co., 1932. 25s.

The contents of this volume are divided into an introduction and 16 chapters, of which Dr. Olsen is the author of the introduction and three chapters, whilst the remaining chapters are from various collaborators each with practical experience of the subject upon which he writes.

The transmission of heat and its utilization in the production of power, evaporators, and stills constitute the subject-matter of the first six chapters, the last of these being devoted to an admirable résumé on the dry distillation of coal in coke ovens and the methods of recovering tar, ammonia, etc. from the gas produced and preparing these products for the markets. Such a chapter, however, seems to be one more suited for a book on industrial chemistry than for this volume. Filtration forms the subject of the next chapter, whilst one of the valuable features in the subsequent chapter on drying is the information relating to the operating costs for vacuum dryers of the shelf, rotary, and drum types. The importance of electrical energy in chemical industry is recognized by two chapters, one on electric furnaces suitable for the production of carbon disulphide chemically pure hydrochloric acid, and similar substances, and the other on electrolysis and electrolytic cells. In the chapter on catalysis and catalytic reactions considerable attention has been given to the work done on the synthetic production of ammonia, and this is followed by a chapter on the adsorption of gases, whilst in the chapter on the separation of solids and liquids from gases, electrical precipitation receives careful treatment. The remaining chapters are concerned with materials used in the construction of chemical plants, costs and financing, and plant location, and give useful information on their respective subjects. No reference is made to such branches of chemical engineering as crushing and grinding, grading, transport of materials, and crystallization, although all are of importance to the chemical engineer.

The book is primarily intended as a text-book to be used under the guidance of a competent teacher and is provided with a number of problems for the student, but the references at the end of each chapter constitute an excellent guide to further study for any reader.

DER CHEMIE-INGENIEUR: Edited by A. Eucken and M. Jakob. Vol. II. Part I. Kontroll- nnd Regliereinrichtungen, Allgemeines und Gemeinsames. By P. Gmelin and J. Krönert. Pp. ix + 208. Leipzig: Akademische Verlagsges., 1932. Paper, 17 rm.; bound, 18·60 rm.

This book is the first part to be published, though not the first in order of sequence, of a handbook of chemical engineering comprising in all 6 parts. The scheme of the handbook is distinctly interesting as it marks a growing appreciation in Germany of the importance of chemical engineering. The conception of chemical engineering as a distinct branch of science, based on the study of unit processes, found general recognition first in the United States and a little later in England. In Germany, strangely enough, this view made slower progress but is now beginning to find a fairly general acceptance. The title of this handbook is in itself evidence of progress in that direction.

The part under review forms a self-contained book on apparatus for process control and regulation in chemical works. Purely analytical methods of control and the testing of materials are excluded as well as the control and regulation of power plant, which is adequately treated in other published works. The scope of the book covers indicating instruments, recording instruments, alarm signal apparatus, distance recording and regulating mechanisms. Chapter I deals with the general principles of process control and regulation, Chapter II with control instruments, and Chapter III with regulating apparatus.

The authors have aimed at dealing with the principles underlying methods of control and regulation and illustrating these principles by reference to different types of instrument, without going into unnecessary detail of instrument construction. They have managed to avoid producing a mere compilation of extracts from makers' catalogues into which a work of this kind might easily degenerate. The book is logically arranged and well illustrated, diagrammatic representation of instrument types being used instead of photographs. Acknowledgment is made to the I. G. Farbenindustrie A.-G. for contributing information based on their experience. The makes of instrument referred to or described are practically without exception of German manufacture. The separate numbering of the illustrations in each chapter, instead of consecutively through the book, is somewhat confusing and does not appear to serve any useful purpose. A. J. V. UNDERWOOD

DER CHEMIE-INGENIEUR. Edited by A. Eucken and M. Jakob. Vol. II. Part 2. Mengenmessungen im Betriebe. By R. Witte and E. Padelt. Pp. ix + 274. Leipzig: Akademische Verlagsges., 1933. Paper, 26 m.; bound, 27·60 m.

This volume deals with the measurement of quantities and rates of flow of materials in process work. The first section deals with the general problem of measurement, the conversion of volume measurements into weights, and the various factors to be considered in making this conversion. The calibration of measuring apparatus and weighing machines is also dealt with. The second section is concerned with methods of weighing. The different methods in use are described at some length and their accuracy and spheres of application are discussed. The testing of weighing machines is also touched upon. The third section deals with the measurement of volumes and describes the different types of meters used for gases and liquids. The last section covers methods for measuring rates of flow which depend on a pressure difference, such as the Pitot tube, orifice plate, and Venturi meter. The book aims to cover both the theoretical and practical aspects of the subject, but the emphasis seems to be rather on the scientific principles underlying the different methods of measurement. A more detailed treatment of the practical questions and difficulties which arise in many cases would have been an improvement. A. J. V. UNDERWOOD

BERL-LUNGE CHEMISCH-TECHNISCHE UNTERSUCHUNGSMETHODEN. Edited by Dr. E. Berl. Vol. III. Eighth revised and enlarged ed. Pp. xlvii + 1380. Berlin: J. Springer, 1932. 98 rm.

The contents of this large, well-printed, and strongly-bound volume cover a wide range of subjects, and the character of the sections seems somewhat heterogeneous. Any one chemist would probably find that his interests

were satisfied by a relatively small part of the book. The contents are: aluminium compounds, clay, earthenware and porcelain (Berl and H. Ludwig), pp. 1—297); mortars and cements (R. Grün, pp. 300—441); glass (*L. Springer, pp. 442—545*); enamels (J. D'Ans, pp. 547—551); barium compounds (A. Hand, pp. 553—579); phosphoric acid and phosphates (Berl, pp. 580—595); artificial fertilizers (M. Popp, pp. 596—640); soils (Haselhoff, pp. 641—681); feeding materials (*F. Mach, pp. 682—705*); calcium carbide and acetylene (Berl, pp. 707—730); chemical preparations, classified as reducing materials (hydrazine sulphate, hydroxylamine hydrochloride, sodium hydrosulphite and its derivatives), oxidizing materials (peroxides and persalts), and miscellaneous (including hypophosphites), as inorganic materials, and a large number of organic substances (alkaloids, drugs, solvents, glycosides, enzymes, photographic chemicals, disinfectants, pharmaceutical preparations, etc. (J. Messner and F. Stadlmayr, of Merck's, pp. 731—1457); explosives and fireworks (P. Naoum, pp. 1159—1337), and lastly subject and author indexes. There are adequate references to the literature in the text. Mechanical and physical methods are included as well as chemical, the descriptions being very detailed and complete, and there is a large amount of general chemical information on the properties of pure substances dealt with. The volume is an excellent work and will be found valuable in the technical laboratory.

ALFRED MOND, FIRST LORD MELCHETT. By H. Bolitho. Pp. 392. London: M. Secker, Ltd., 1933. 21s.

This is a remarkably well-written biography of a very remarkable man. Alfred Mond was well known to chemists and chemical manufacturers and was a familiar personality to the members of the Society of Chemical Industry of which he was president at the time of his death; many of us knew him mainly as a man of business in charge of great chemical and other industrial organizations but he had wide interests apart from business, in politics, in labour questions, in economics, in art, and towards the end of his life an absorbing interest in Zionism. He came of a remarkable family; his father Dr. Ludwig Mond was a man of great ability, great scientific attainments, and great ambition. He had a very exceptional determination that enabled him, usually by hard work, to overcome the technical difficulties that faced him throughout his long and busy life; his mother Mrs. Mond was a cousin of Ludwig and both of them had a love of art and music and an appreciation of the intellectual side of life. They had this love and this appreciation in a very full measure and as they became rich they were able to collect treasures and to know intimately great pictures and good music and artistic and literary people. Alfred Mond was bred up in such surroundings and he could at a very early age, had he chosen, have taken up a good position as a chemical manufacturer and devoted his life to that pursuit. In this way he was as determined and dogged and inflexible as his father, using the word inflexible to mean not to be turned from the course that his judgment convinced him was the right one. Mr. Bolitho's biography is written in a charming and vivid style and is a very readable book; it gives a clear account of a man who had an unusually fine brain, exceptional judgment and common sense, a great interest in the human life of this country, and many other absorbing interests. Alfred Mond's life as a chemical manufacturer has not been treated so fully as many of us could have wished and this part of the book could be extended and amended; even in this part we are grateful to Mr. Bolitho for an interesting though brief notice of the work of Dr. Ludwig Mond and Sir Alfred Mond, whom we find hard to remember as Lord Melchett. It is interesting to trace in the Mond family strong characteristics descending from generation to generation; the present Lord Melchett has many of these and the student of heredity will be interested in this biography as well as many other readers. We feel sure that this book will be read with pleasure and profit.

IN CHASE OF TRUTH OF ALCOHOL. By H. E. Armstrong, F.R.S. No. 8. Pp. 32. London: True Temperance Scientific Committee. 1s.

Those of us who are acquainted with the author of this monograph or with his writings published during recent years, expect from him something both entertaining and instructive. "In Chase of Truth of Alcohol" is certainly a contribution of this kind and will, in all probability, stand out as one of Prof. Armstrong's most frivolously serious writings. To those who have passed through the author's hands, much of the subject-matter will be familiar; to those who have a wide knowledge of chemistry, nothing will be new; but, to those whose chemistry is meagre or non-existent, who make up the great body of people, this monograph will surely prove attractive both in subject-matter and style, helping them, as it will, to appreciate a little more the wonders of their surroundings.

The cynicism and destructive wit of Bernard Shaw has a large audience, mainly because his themes are on the level of the general intelligence. Wells has also a wide following, because he writes extravagantly and with imagination and in a very readable manner on things already of general interest. How much easier is all this than revealing, as Armstrong does in this monograph, the wonders of natural happenings to an audience with little, if any, knowledge of these things upon which to build. Since the days of Huxley none has thought it worth while nor has possessed the power of pen to impart to the many a clear understanding of simple scientific matters. Prof. Armstrong gives a series of little discourses, all joined up on the "one-damn-thing-leads-to-another" principle, on combustion, chalk, rusting of iron, water, starch, malting, plant assimilation, conversion of cane sugar, fermentation, and a great deal more besides. Properly understood, this is no "meandering story" as he calls it, but a definite and welcome contribution. It should encourage a better appreciation and general understanding of chemical change. Careful reading shows that much thought has been bestowed upon it, and the True Temperance Scientific Committee is to be congratulated upon its courage in putting in the hands of the public this "Latter Day Pamphlet."

BOOKS REVIEWED, OCTOBER 1932 TO MAY 1933

The date of publication of each review is given in brackets at the end of each entry

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Ernest Benn, Ltd.

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Blackie & Son, Ltd.

The Physics of Solids and Fluids, with Recent Developments. By P. P. Ewald, Th. Pöschl and L. Prandtl. Translated by J. Dougall and W. M. Deans. (17s. 6d.) A Textbook of Physics (7th ed.). By E. Grimsehl—edited by R. Tomaschek. Authorized translation by L. A. Woodward. Vol. I. (15s.) Vol. II. (12s. 6d.) (*Later volumes in preparation.*) The Technique of Ultra-Violet Radiology. By D. T. Harris. (6s.) Elementary Chemical Calculations. By E. Biggs. 2s. The Structure of Molecules. Edited by P. Debye. Authorized translation by W. M. Deans. (15s.)

Cambridge University Press

The New Background of Science. By Sir J. Jeans. (7s. 6d.—ready May 19.) The Expanding Universe. By Sir A. Eddington. (3s. 6d.) Increasing Return: A Study of the Relation between the Size and Efficiency of Industries. By G. T. Jones. (18s.) Gas Analysis by Measurement of Thermal Conductivity. By H. A. Daynes. (16s.) A Chemistry for Schools. By H. A. Wootton and C. W. R. Hooker. (6s.)

W. & R. Chambers, Ltd.

Elementary Science—A Comprehensive Course. By J. B. Guthrie. Pt. I. (1s. 6d.) (Pt. II in preparation.)

Chapman & Hall, Ltd.

The Conductivity of Solutions. (2nd ed. revised and enlarged.) By C. W. Davies. (15s.) Lubricating and Allied Oils. (2nd ed.) By E. A. Evans. (9s. 6d.) Principles of Fruit Preservation. By T. W. Morris. (15s.—ready shortly.) Fluorescence Analysis in Ultra-Violet Light. By J. A. Radley and J. Grant. (*About 12s. 6d.—ready May or* June.) Measurement of Air Flow. (2nd ed.) By E. Ower.

(15s. ready shortly.) The Methods of Cellulose Chemistry. By C. Doree. (21s.) Modern Physics. By G. E. M. Jauncey. (22s. 6d.) Secondary Aluminium. By R. J. Anderson. (42s.) Qualitative Organic Analysis. (2nd ed.) By O. Kamm. (16s. 6d.) Manual for Food Preparation Study. By F. B. Kane. (9s. 6d.) Outline of Atomic Physics. By Blackwood, Hutchisson, and others. (21s. 6d.)

Chemical Catalogue Co., Inc.

Chemistry and Technology of Cracking. By A. N. Sachanen and M. D. Tilicheyev. ($8.)

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The Examination of Waters and Water Supplies. By Thresh, Beale, and Suckling. 4th ed. Revised and re-written. (42s.) Catalysis and its Industrial Applications. By E. B. Maxted. (36s.) A Text-book of Pharmacognosy. By H. G. Greenish. 6th ed. (25s.) The Science and Practice of Pharmacy. By R. R. Bennett and T. T. Cocking. 2 vols. (18s. each vol.) The Practice of X-Ray Therapy. By H. Davies. (In the press.) Recent Advances in Radium. By R. Ward and D. Smith. (In the press.)

C. Griffin & Co., Ltd.

The Synthetic Dyestuffs. (7th ed. re-written and enlarged.) By J. C. Cain, J. F. Thorpe and R. P. Linstead. (Ready shortly.) Physical Chemistry. By J. Newton Friend. Vol. I. General Properties of Elements and Compounds. (24s.) Vol. II. Principles Involved in Chemical Reactivity. (In preparation.) Metallic Alloys. (5th ed.) By G. H. Gulliver. (12s. 6d.) Practical Concrete. By J. Singleton-Green. (8s.) The Official Year-Book of Scientific Societies. (10s.)

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Vitamins and other Dietary Essentials. By A. R. Aykroyd. (7s. 6d.)

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British Industries and Their Organization. By G. C. Allen. (10s. 6d.) Indian Industry and its Problems. Vol. I. Factors in Industrial Development. By H. R. Soni. (Rs. 10.) Introduction to Internal-Combustion Engineering. By J. O. Sneeden. (Probably 6s. Ready June 1.)

Macmillan & Co., Ltd.

Tropical Soils. By Dr. P. Vageler. General Mechanics. By M. Planck. Translated by H. L. Brose. (12s.) Industrial Chemistry (5th ed.). By A. Rogers. 2 vols. (30s. each.

Methuen & Co., Ltd.

Physico-Chemical Methods. (2nd ed., completely revised and re-set.) By J. Reilly and W. Rae. (42s.) Monographs on Physical Subjects. (Edited by B. L. Worsnop).—Atmospheric Electricity, by B. F. Schonland and the Method of Dimensions, by A. W. Porter. (Each 2s. 6d.) Atomic Structure and Spectral Lines. (3rd ed., revised.) By A. Sommerfeld, translated by H. L. Brose. 2 Vols. (32s.) Monographs on Chemical Subjects. (Edited by C. S. Salmon.) Adsorption, by S. J. Gregg and Galvanic Cell, by J. A. V. Butler. (To be published Autumn, 1933.)

Mr. J. Murray

General Science. By H. G. Mitchell. (Ready shortly.) Clues and Crime. By H. T. F. Rhodes. (6s.)

Sir Isaac Pitman & Sons, Ltd.

A Chemistry Course for Painters and Decorators. By P. F. R. Venables and H. C. Utley. (3s. 6d.)

George Routledge & Sons, Ltd.

Textile Electrification. By W. Stiel. (63s.) The Rise of the British Coal Industry. By J. U. Nef. 2 vols. (42s.)

SOCIETY OF CHEMICAL INDUSTRY

OFFICIAL NOTICES

Annual General Meeting. Notice is hereby given that the annual general meeting of the Society will be held in Armstrong College, Newcastle-on-Tyne, on Tuesday, *July 11, 1933, at 11 a.m.*

The existing composition of Council was published in the JOURNAL of January 6. Dr. R. H. Pickard will retire from the office of President and Council has nominated Dr. J. T. Dunn to take his place for the year 1933–34.

The following vice-presidents will retire, viz.: W. A. S. Calder, H. Levinstein, F. L. Pyman, and H. Talbot. They are not eligible before the lapse of a year for election as vice-presidents or ordinary members of Council. Council has nominated in their *places*: J. B. Firth, F. A. Greene, R. H. Pickard, and Edwin Thompson.

The following four ordinary members of Council retire at the annual meeting and are not eligible for re-election: F. W. Bain, F. A. Greene, L. A. Jordan, L. H. Lampitt.

Nominations are invited of members to fill these four vacancies. They must be made on Form B, obtainable from the General Secretary, at 46, Finsbury Square, London, E.C.2. They must be signed by not less than five members and by the candidate, and must be posted to the General Secretary before June 5. No member may sign more than one nomination paper. Overseas members may secure copies of Form B on application to their local honorary secretary.

American Section. Dr. Foster D. Snell, hon. secretary of the Section, has moved both office and laboratory to larger premises at 305, Washington Street, Brooklyn, N.Y., which now becomes his official address for the Society's business.

CHEMICAL ENGINEERING GROUP

The annual meeting and dinner of the Chemical Engineering Group of the Society of Chemical Industry was held at the Waldorf Hotel, London, on Friday, *April 28. Mr. J. Arthur Reavell, (chairman of the Group)* presided on both occasions.

ANNUAL MEETING

Mr. Donald McDonald (honorary secretary) in his report on the past year's working said that whilst there had been a slight fall in the membership during the year this need not be taken too seriously having in view the difficult circumstances which had existed. It was an *indubitable fact that the Group was passing through the* economic crisis with less trouble than many of the societies which were doing similar work, but at the same time he urged the members to do all they possibly could to bring the membership back to its former figures. Referring to the discussions that had taken place upon the Address of the President of the Society at the annual meeting in Nottingham last July in which the urgent need for co-operation and co-ordination between scientific and technical societies with a view to providing

better service at a less cost with fewer societies and better meetings was emphasised—Mr. McDonald stressed the point that it had always been the aim of the Group to co-operate with other bodies of similar nature on every possible occasion. In this connexion he pointed out that all the meetings arranged for the 1933—4 session were joint meetings with other societies.

After pointing out that the accounts for the past year show a small excess of income over expenditure, the hon. secretary expressed the sincere thanks of the committee of the Group to the Council of the Society for its continued interest and encouragement and also recorded the appreciation of the committee of the work of Mr. Mackie, the assistant secretary, and his staff throughout the year. The report and accounts were unanimously adopted.

The following elections were announced for the ensuing year:—*Chairman:* Mr. W. A. S. Calder; *Hon. Secretary:* Dr. Donald McDonald: *Hon. Treasurer:* Mr. F. A. Greene; *Committee:* Mr. A. W. K Carnegy-Potts, Mr. J. M. Leonard, Dr. W. P. Joshua, and Mr. J. Arthur Reavell.

Cordial votes of thanks were passed to the chairman (Mr. J. Arthur Reavell) and the hon. secretary and the hon. treasurer for their services during the year.

Annual Dinner

The guest of honour at the annual dinner which followed was the Rt. Hon. Lord Melchett, and among others present were Dr. R. H. Pickard, F.R.S. (president, Society of Chemical Industry); Dr. E. F. Armstrong, F.R.S.; Sir Frank Smith, F.R.S.; the Rt. Hon. Lord Leverhulme (president, Institution of Chemical Engineers); Mr. J. Davidson Pratt (Association of British Chemical Manufacturers); Mr. E. A. Alliott; Dr. S. G. Barker; Mr. W. A. S. Calder, Dr. R. T. Colgate (hon. treasurer, Society of Chemical Industry), Mr. H. W. Cremer (hon. secretary, Institution of Chemical Engineers), Dr. W. Cullen; Sir Henry Fowler, K.B.E.; Mr. George Gray; Dr. L. H. Lampitt; Dr. H. Levinstein; Mr. Donald McDonald (hon. secretary, Chemical Engineering Group); Dr. Stephen Miall (editor Chemistry and Industry); Mr. C. F. Mounsdon (president, Diesel Engine Users' Association); Mr. P. Parrish; Mr. H. J. Pooley (gen. secretary, Society of Chemical Industry); Mr. F. H. Rogers; Mr. F. A. Greene; Mr. S. J. Tungay, and Dr. A. J. V. Underwood.

The principal speech of the evening was an address by the Rt. Hon. Lord Melchett on "Modern Economics and Unemployment" in the course of which he put forward a few of the ideas which he said had been passing through his mind—and no doubt the minds of others—during the past few years during which, in a rapidly changing world, entirely new sets of conditions had been arising which required entirely novel solutions. Within the last century the development of science had been such that there were practically no products which we could not produce to-day in almost unlimited quantities, for all practical purposes; the difficulty was not one of production but of distribution and it was in the distribution of the primary commodities that we had entirely failed hitherto. The list of primary commodities numbered about 26 but there was one which we were producing to-day at an alarming rate and with amazing efficiency which never appeared on that list but which in future years must be included in it, *viz.*, leisure, and it was just as important to mankind as any of the others. We had been producing enormous quantities of leisure throughout the post-war period, and he preferred this name to unemployment because that seemed to him a misnomer. The Chancellor of the Exchequer had recently stated in the House of Commons that unemployment on something like its present scale was likely to last for another ten years but if he had said a hundred years he would have been much nearer the mark. The reason for that was that from year to year we were finding more and more means of conducting industrial operations by mechanical methods with fewer and fewer men. More ways were being found for the individual man to increase his output to an alarming extent every day and as he had said on more than one occasion, he was convinced that science would put more men out of work than any Government would have the brains to put into work. Although that could be looked upon as a very serious and a very terrible thing, the fact was that we had reached a stage in human development where we were able to afford a very large amount of leisure to the masses of our population who, in the past, had not had the opportunity of enjoying any leisure at all although we had not yet become used to conceiving that idea. That was, therefore, an aspect of the labour question upon which he wished to dwell.

Continuing, Lord Melchett said that his own conception of this production of leisure brought about by the increased application of science to industry, which could be expected to increase in the future, was that it could be used for the positive benefit of mankind. It was possible to regulate leisure within our own country in such a way as to obtain the maximum benefit from it instead of, as was the case to-day, making it one of the greatest evils that ever afflicted the human race. It was a terrible thing to contemplate that we were bringing up a generation of young men and young women many of whom had never worked at all, who had never known what it was to have to work and who had never been subjected to the normal discipline of any sort of regular occupation, and, moreover, who had not had the opportunity of acquiring at an early age skill in any sort of trade. We were at the present time bringing up a generation of people who were accustoming themselves to a low standard of living based upon idleness and who, in consequence, were developing the idea at the back of their minds that there was no place for them in the world, that there was no necessity for their existence and that they might just as well be dead for all the world cared. That was a terrible thing to contemplate. These people were being under-fed, they were not too well housed, and they were under-developed as we should feel that citizens of this country should develop. All this was tending to the breaking up of the national spirit or the national ideal which should be considered essential to the up-building of our national character. In these circumstances it was going to be hard to fit these people into industrial life as their fathers and grandfathers were brought into it and, moreover, we had to realize that this problem was not

getting easier but more difficult. During the year 1934 he was told there would be 438,000 boys and girls of 14 leaving school and entering employment, as compared with 292,000 in 1932. That increase would continue and the peak would be reached in about 1937; therefore a substantial improvement in industrial conditions was not going to solve this problem of the over-production of leisure. On the other hand it was highly probable that between 1934 and 1937 methods would be devised—among others by some of those present that evening—which would have the effect of putting more people out of work than the increase in productive capacity would put into work.

Every employer of labour on a large scale to-day, continued Lord Melchett, is faced with the problem of deciding to perform his industrial operations with fewer men and greater efficiency or to keep on the same number of men and perform the operations with less efficiency and less economy. The majority of industrial employers would prefer to remain incompetent rather than put these men out of work, but in the large organizations which existed to-day decisions had to be made on questions of high policy and with great heart searching and those responsible for these large organizations had made up their minds that their first duty to their industry and to their country was to be as efficient as possible and to place on the nation as a whole the responsibility of solving this dreadful question of unemployment or, as he himself preferred to call it, the over-production of leisure. It was impossible to conceive employers in every industry deliberately allowing themselves to become inefficient, however humanitarian or however sympathetic their reasons might be. If such were the case the result for the nation as a whole would be disastrous; therefore we were bound to assume that the result of this problem of increased efficiency was not a matter for the individual employer and he himself had come to the conclusion that sooner or later we should have to organize the country in such a way as to shorten the hours worked, not however by shortening the number of hours per day or the number of days per week. Frankly he did not believe we should be very much better off by working 5 days a week instead of 5½, or by having a shorter working day. After all, eight hours a day was a reasonable period of work for a normal man. What, however, could be done was to pool a man's unemployment and leisure together in such a way that he would have, under an organized system, a month, two months, or even three months leisure allotted to him as a definite part of his employment. The man would be required to sign off for that period and then to sign on again under an organized system in which all workers would take part, but he should also be compelled to make profitable use of that period of leisure to improve his position intellectually and physically. At the present time the unemployed were wasting the leisure that was forced upon them and were a great source of expense to the nation without any result whatsoever, but under an organized scheme such as he had suggested a very much larger number of people would be provided with work with a definite period of leisure which they would be compelled to make profitable use of. For instance, during the period of leisure, a subsistence rate of pay would be granted, but those who made the most profitable use of this period by improving their efficiency in the work in which they were engaged and in other ways—opportunities for which also, of course, would have to be on an organized basis—would receive higher payments and rewards. If some such policy as this were adopted he was convinced that in five years there would be a dramatic and real change in the educational outlook of the population of the country. Another aspect of the problem, if it were tackled on these lines, was the opportunity that would be afforded for the real physical development of the people which at the present time was quite impossible. Why, said Lord Melchett, should the opportunity for such physical development be confined, as it was mainly to-day, to those who were fortunate enough to be sent to the public schools?

Coming to the financial aspect, Lord Melchett contended that such a scheme would not cost any considerable sum of money as compared with the cost of unemployment to the country at the present time when 75% of the population were working with a fortnight's holiday each year, a most irrational system with so many unemployed. Undoubtedly there would be difficulties and obstacles but he did not believe there were any which could not be overcome. There would have to be licensing and the exemption of certain key men from the general rule, but he believed that such a system was the only solution to this fearful problem which was capable of sapping the most vital qualities upon which the nation had depended in the past.

The Budget, concluded Lord Melchett, was a sound and solid affair, but it rather reminded him of the suet pudding which was fine tack for the healthy man but liable to be very dangerous to the invalid. What this country needed was a stimulus, a little champagne, something with a little more imagination and vitality to get us out of our difficulties. It must be borne in mind that industry and the development of commerce are dynamic things and that when they went forward they did so together, and if they went down they went down together. Therefore we needed a little help, stimulus, and energy from the Government to make that great development of which the country was capable.

Sir Frank Smith (secretary, Department of Scientific and Industrial Research), proposing "The Society of Chemical Industry," said he shared many of the views which Lord Melchett had expressed although there were some others in which, perhaps, he could not go quite so far. The Chemical Engineering Group was perhaps one of those sections of the community which were looked upon by some people as a curse of civilization because its work, like the work of other engineering organizations such as the Institutions of Electrical, Civil, and Mechanical Engineers and others, was responsible for progress and there were a number of people in this country who did not like progress.

Dr. R. H. Pickard, F.R.S. (president, Society of Chemical Industry), with whose name the toast was coupled, said he did not feel capable of following Lord Melchett and Sir Frank Smith into a disquisition on questions of political economics, but he was tempted to ask what was going to happen to the leisure of the

research worker if all our leisure was to be organized. For instance, he could not imagine the secretary of the Royal Society devoting his leisure in any other way than continuing his scientific researches and that being so—and the same applied to all research workers—the amount of leisure now being super-abundantly produced would be still more super-abundantly produced as the result of the efforts of research workers in their organized leisure! There seemed the possibility of a vicious circle there but perhaps Lord Melchett would say something about that at the Group's dinner next year. Congratulating the Chemical Engineering Group on its virility and great success during the 15 years it had been in existence, *Dr. Pickard recalled the formation of the* Group at the instance of some of the progressive members of the Society, although it was regarded with a certain amount of fear at the time by some of the older members. Thanks, however, to the success of the Chemical Engineering Group, the system of groups had been carried a good deal farther and other groups had been formed. Moreover, he congratulated the Chemical Engineering Group upon the way it co-operated with other bodies and called special attention to the fact that every meeting provisionally arranged by the Group for next session was a joint one with another group or society. The whole fabric of the Society with its geographical sections and its subject groups was such as to constitute an outstanding example of organization of a technical society and was one which could be still further extended to possibly *the other chemical bodies who were now considering* some form of co-operation. The Chemical Engineering Group made its first appearance at the annual meeting of the Society of Chemical Industry in Newcastle in 1919. The Society was again holding its annual meeting in Newcastle this year, and a feature would be the large amount of time devoted to the proceedings of the different subject groups. As president of the Society, therefore, he wished the Chemical Engineering Group even greater prosperity and success in the future than it had achieved in the past.

Mr. W. A. S. Calder proposed the toast of "Our Guests."

The Rt. Hon. Lord Leverhulme (president, Institution of Chemical Engineers) responded and said that whereas at the last annual dinner of the Group they listened to Sir Robert Horne who was a past-Chancellor of the Exchequer, he wished he could have said that they had been listening to a future Chancellor of the Exchequer on the present occasion, but Lord Melchett had gone to that higher realm of the legislature where Chancellors of the Exchequer were not to be found. It was, perhaps, an example of the Gilbertian way we had of conducting national affairs in this country that we had an Upper House containing so many representatives of industry and finance and to which members were so frequently added by recruitment from the ranks of industry and finance but which had no effective control over the nation's accounts. In conclusion, he said he was constantly attending meetings in which members of the Reavell family took prominent parts and the sound of "reavelry" by night was a feature of engineering society.

Proposing "The chairman," Dr. H. Levinstein spoke of the long and valuable service rendered to the Group by Mr. Reavell.

The chairman responding to the toast said he had not been more touched in his life than when he had been *asked to act as chairman of the Group for a second time*, after having previously occupied the position for four years and working with the late Prof. Hinchley, Mr. Talbot, Mr. Garland, Mr. Rogers, and the others who had taken such a leading part in the affairs of the Group.

LONDON SECTION

The annual general meeting of the Section was held on May 1 at Burlington House, with the chairman, Dr. G. W. Monier-Williams, presiding. The following officers were elected for the ensuing year: *Chairman:* Dr. J. J. Fox; *Vice-Chairman:* Dr. G. W. Monier-Williams; *Hon. Secretary:* Dr. H. E. Cox; *Committee:* Messrs. G. D. Bengough, E. T. Brewis, W. J. A. Butterfield, F. H. Carr, J. Vargas Eyre, G. T. Morgan, F. A. Greene, L. A. Jordan, J. Davidson Pratt, F. M. Potter, C. E. Sage, A. L. Bacharach, R. Lessing, and P. May. The last three members are new members of the committee.

Dr. G. W. Monier-Williams reported that the Section had enjoyed a number of successful meetings during the year, the attendance averaging more than 100 members. This he believed was better than at any time in the previous history of the Section, and it indicated that chemists appreciated that the papers read at the meetings enabled them to keep abreast of the times. A hearty vote of thanks was accorded to Dr. Monier-Williams, being proposed and seconded by Mr. Julian Baker and *Dr. R. Lessing, who paid tribute to the efficient and* pleasant way in which the chairman had conducted the meetings, thereby contributing largely to their success. Thanks were also given to Dr. H. E. Cox for his good offices as honorary secretary.

Following the meeting an address was given by Dr. Cecil H. Desch on "Ageing and Age-hardening in Metals." Ageing, by which was understood a deterioration of either mechanical or magnetic properties with time, was first observed in 1895 in connexion with the iron and mild steel employed in the cores of a.c. transformers, but no explanation of the phenomenon was then apparent. The subject came into prominence again in 1911, when it was observed that spontaneous changes could occur in the new light aluminium alloy Duralumin. These changes could occur at ordinary temperatures, but were accelerated by heating to moderate temperatures.

It was then observed that in all cases in which ageing or age-hardening occurred the conditions were such that a small quantity of some substance held in solid solution at a high temperature fell out of solution at a low temperature at a comparatively slow rate. The discovery of the cause of this phenomenon had the effect of directing attention to the behaviour of many other alloys.

The precipitation of the excess material in all probability occurred first in the form of layers only one molecule thick parallel with certain important planes in the lattice of the solvent metal; with increasing time or temperature diffusion occurred and crystal nuclei arose in these two dimensional sheets which then proceeded to grow. These processes involved a certain amount of distortion of the original lattice; with

continued growth rearrangement occurred, and by the time the crystallizing substance had aggregated to form particles of microscopic size the distortion had been relieved and the original hardening effect diminished. On account of these changes, which proceeded simultaneously, curves showing hardness, electrical conductivity, and other properties of the alloy showed maxima which did not coincide. The age-hardening effect made it possible to produce very marked changes in the properties of many alloys, some of which proved to be of great technical benefit. In other cases the deterioration of metals could be traced to a similar process and the effect could be prevented by the removal of small quantities of foreign elements, sometimes so minute or apparently so unimportant as to have been neglected hitherto.

In the early work on ageing it had been observed that the phenomenon was associated notably with mild steels containing nitrogen, and with the information resulting from the work on non-ferrous metals, work on mild steel ageing was resumed. In the age-hardening of steel it appeared that a nitride, probably Fe_4N, was precipitated from solid solution. Steels now employed for transformer work contained little N and did not show ageing. Although nitrogen appeared to have the greatest effect, other elements in solid solution, such as oxygen and carbon, could also bring about ageing in mild steels. Since the quantities involved were very small it had been found that important changes in the properties of metals could be brought about by the addition of exceedingly minute proportions of other elements.

X-Ray studies had yielded much information on ageing and age-hardening, but it was necessary to use great caution in the interpretation of these results since they averaged the behaviour of very great masses of the metals and did not enable one to resolve small particles. A great deal of refined *X*-ray technique was however being brought to bear on the subject. It was possible now to explain many of the phenomena. It seemed that a definite crystallographic relation existed between the solid and the precipitate. The lecturer was of the opinion that the ultimate solution of the problems of ageing and age-hardening would be largely geometric, concerned with the movement of atoms and their ability to migrate and form nuclei.

A number of interesting slides were employed by the lecturer to illustrate the phenomena described, and, in conclusion, some typical examples were given of the beneficial application of the results so far obtained. A typical example was connected with the austenitic steels used in the electrical industry. The tensile strength of such steels was low, but although cold-working led to an increase in the tensile strength, this factor could not be employed owing to the fact that it led to a change from the γ to the α condition of the iron, so that the steel became magnetic. The addition of a compound of molybdenum on titanium, having a high solubility in the metal at high temperatures, and low solubility at low temperatures, produced a material which could be worked to increase the hardness without changing the magnetic properties.

An interesting discussion followed, to which contributions were made by Dr. G. W. Monier-Williams, Dr. Lessing, Dr. Vernon, Dr. Bengough, and Messrs. Archbutt, Skirrow, Barrs and Avery Clayton.

Replying to points raised, Dr. Desch stated that the inequalities of steels at high pressures in boilers was not to be attributed to ageing, but rather to "creep," on which much work was going forward. Age-hardening had no connexion with the "nitriding" process. There was no effect from the absorption of nitrogen by iron rich in carbon. He did not think there were any secrets of the mediæval craftsmen that were not explained by modern scientific knowledge, and equally good steel blades etc. could be produced at the present day if sufficient trouble were taken. An interesting point had been raised with regard to the additive effects in age-hardening. There was no doubt that working of metals was additive to age-hardening, but the effect of different elements was more complicated, and such elements were not always completely additive in effect. An example was the presence of carbon in steel, which inhibited the action of nitrogen.

PLASTICS GROUP

The annual general meeting of the Plastics Group was held on Wednesday, April 26, 1933, in the Lecture Theatre of the Science Museum, South Kensington, immediately after Mr. Foster Sproxton's lecture, both meetings being well attended. The following officers were elected for the ensuing year: *Chairman:* Mr. H. V. Potter: *Vice-chairman:* Dr. L. A. Jordan; *Hon. Treasurer:* Mr. C. Chapman: *Hon. Secretary:* Mr. A. Lowe (all re-elected): *Committee:* Messrs. G. Dring, H. Hepworth, W. J. Jenkins, W. J. S. Naunton, M. E. H. Parkin, H. W. Rowell, Foster Sproxton, H. Talbot, A. J. Gibson, N. J. L. Megson, W. H. Nuttall, and F. M. Potter. The last four are new members of the committee.

Mr. Lowe reported a very satisfactory first season's work, the membership having reached 86. Special reference was made to the success of the Plastics Exhibition at South Kensington, and the accompanying series of lectures. The chairman testified to the arduous and unselfish work of the committee and officers.

After the business of the meeting cinematograph films were shown dealing with the manufacture of gun-cotton (I.C.I.) and of a typical resinoid (Bakelite) and its uses.

CANADIAN MINING

Canada produced more gold last year than ever before, the total output reaching 3,055,168 fine ounces, worth $63,156,000, in addition to exchange premiums paid to gold mining companies amounting in all to $6,103,000. The increase over the figures for 1931 was 13·4%, and the output was 65% in excess of that five years ago, and 142% greater than the production 10 years ago.

The Dominion Bureau of Statistics at Ottawa reports that the production of pig-iron in Canada during 1932 totalled 144,130 long tons, as compared with 420,038 t. in 1931 and 747,178 t. in 1930. Imports of pig-iron totalled 4753 long tons, a decline of 39% as compared with the previous year.

CORRESPONDENCE

PURIFICATION OF CRUDE SALTPETRE

SIR,—The article by Dr. Datta on "The Purification of Crude Saltpetre" in your issue of April 28 involves a misapprehension. He quotes the solubilities at 100° C. and 20° C. for the individual salts potassium nitrate and sodium chloride and assumes that they will behave in a similar manner when both are present in solution. When the solution is saturated with respect to both nitrate and chloride, instead of the sodium chloride being more soluble at the higher temperature the reverse is the case. The data for the salt pair potassium nitrate-sodium chloride have been worked out by W. Reinders, *Zeit. f. anorg. Chem.*, **93**, 202 (1915); F. Frowein and E. von Muhledal, *Zeit. f. angew. Chem.*, **39**, 1488 (1926); E. Cornec and H. Krombach, *Ann. chim.*, **12**, 235 (1929), the rather remarkable error by Reinders for 100° C. being subsequently corrected by Cornec and Krombach. A solution saturated with common salt and *not quite saturated with nitrate will give a* deposit of salt on the bottom of the crystallizing pans, *which owing to its being covered up immediately with* nitrate is not able to re-dissolve in the mother liquor, and *this may account for the high salt content found.* The method of adding water to a mixture of two salts, both being less soluble at the lower temperature, has been used for separating potassium nitrate from sodium nitrate for munition purposes during the last war [cf. P. F. Holstein, J.I.E.C., **12**, 292 (1920)] and is also used for separating potassium perchlorate from crude sodium nitrate solutions as this salt is detrimental to agriculture.

I am, Sir, etc.,

M. B. DONALD

London University College,
W.C.
May 1, 1933

PERSONAL AND OTHER ITEMS

We regret to learn of the death on April 27 of Sir Arthur Whitelegge, who was for 21 years Chief Inspector of Factories and Workshops. He was a Fellow of University College, London.

Mr. H. T. Tizard, C.B., F.R.S., Rector of the Imperial College, London University, has been elected to an Honorary Fellowship at Oriel College, Oxford University. Mr. Tizard was formerly a Fellow of Oriel College and Reader in Thermodynamics in the University.

It is reported from Germany that Prof. W. Polanyi, the noted physical chemist, and Prof. H. Freundlich, who is famous for his work in colloid chemistry, have resigned from their positions at the Institute of Physical Chemistry of the Kaiser Wilhelm Gesellschaft, at Dahlem, Berlin. Prof. Polanyi and Prof. Freundlich were in charge of departments at the Institute, and although under no compulsion to resign, they have done so following the dismissal of Jewish employees in their laboratories.

The Council of the University of Manchester has received with regret notice of the retirement at the end of the present session of Dr. John Prescott, lecturer in mathematics in the Faculty of Technology. Dr. Prescott has been a member of the staff of the College of Technology since 1905.

The Science Service, Washington, has announced the appointment of Dr. Lyman J. Briggs as director of the U.S. Bureau of Standards in succession to Dr. G. K. Burgess, who died on July 2, 1932. Dr. Briggs has been in charge of the Division of Mechanics and Sound in the Bureau since 1920. He is well known as the co-inventor, with Dr. Paul Heyl, of the earth-inductor compass which is now widely used in aircraft.

The American Institute of Mining and Metallurgical Engineers has awarded the James Douglas Medal to Mr. J. C. Elton for his conspicuous work in the treatment of smelter fume, the production of electrolytic zinc, and other metallurgical work. The medal is the highest metallurgical honour in the United States.

We regret to learn of the death in America of Dr. A. M. Comey, for many years director of the explosives research laboratory of E. I. du Pont de Nemours. He was the author of a Dictionary of Chemical Solubilities, published in 1896, with a second edition in 1921.

We regret to announce the death on April 28, at the age of 61, of Mr. E. A. Lane, managing director of United Dairies (London) Ltd.

We regret to record the death in Australia of Mr. E. C. B. Heden, a notable mining engineer, and since 1922 an associate editor of the *Chemical, Engineering and Mining Review* of Australia.

Mr. H. T. Wardle, silk dyer, of Staffordshire, left estate of gross value £57,434, with net personalty £54,757.

Mr. D. Mackenzie, a former chairman of T. & H. Smith, Ltd., manufacturing chemists, of London and Edinburgh, left estate of gross value £14,216, with net personalty £13,002.

We regret to learn of the death on April 15 of Mr. Alfred Bennett, of Widnes, at one time manager of the Pilkington Sullivan works of the United Alkali Co.

Beilby Memorial Awards

From the interest derived from the invested capital of the Sir George Beilby Memorial Fund, at intervals to be determined by the administrators representing the Institute of Chemistry, the Society of Chemical Industry, and the Institute of Metals, awards will be made to British investigators in science to mark appreciation of records of distinguished original work, preference being given to investigations relating to the special interests of Sir George Beilby, including problems connected with fuel economy, chemical engineering, and metallurgy. The administrators of the fund are the presidents, the honorary treasurers, and the secretaries of the three participating institutions.

Awards will not be made on the result of any competition, but in recognition of continuous work of exceptional merit, being evidence of distinct advancement in knowledge and practice. Two awards of £250 each were made in 1930 and two awards of £105 each in 1932.

The administrators will meet in June next and will be glad to have their attention directed to outstanding work

of the nature indicated. Correspondence on this subject should be addressed to the Convenor, Sir George Beilby Memorial Fund, the Institute of Chemistry, 30, Russell Square, London, W.C.1, not later than June 1, 1933.

Royal Institution

At the annual meeting of the Royal Institution on May 1 Lord Eustace Percy was re-elected president for the ensuing year, with Sir Robert Robertson as treasurer and Major C. E. S. Phillips as secretary. The meeting elected as managers: Sir Frederick Berryman, Sir James Crichton-Browne, Prof. Alfred Fowler, Sir Daniel Hall, Dr. K. R. Hay, Dr. G. W. C. Kaye, Sir Henry Lyons, Lord Melchett, Sir Henry Miers, Prof. C. S. Myers, Sir Richard Paget, Mr. C. C. Paterson, Mr. R. W. Paul, Dr. G. C. Simpson, and Mr. H. E. Wimperis; and as visitors: Dr. W. A. Caspari, Prof. W. C. Clinton, Dr. C. V. Drysdale, Prof. G. E. Gask, Prof. C. S. Gibson, Capt. A. C. Goolden, Dr. David Heron, Mr. A. Jaffe, Mr. J. Kewley, Mr. W. Macnab, Mr. A. Marshall, Prof. A. O. Rankine, Mr. W. S. Rowntree, Mr. T. H. Sowerby, and Mr. F. Coston Taylor.

It was announced by the president that payments in connexion with rebuilding had been completed. During the last three years the managers had been successful in collecting £96,300 for the rebuilding and research endowment.

At the conclusion of the meeting Major C. E. S. Phillips, on behalf of a group of friends, presented the institution with a portrait of Sir William Bragg. The portrait, which is by Mr. William Nicholson, is intended to express members' appreciation of Sir William's scientific achievements and the manner in which he has upheld the traditions of the Royal Institution.

Plastics Exhibition

We are asked to announce that the Museum authorities, recognizing the attractions of the Derby, have arranged to postpone Prof. Morgan's Wednesday Lecture from May 31 to a later date.

The remaining lectures will take place as announced every Wednesday at 4.30 p.m. in the Science Museum Lecture Theatre.

British Science Guild Lectures

Sir Harold Carpenter, F.R.S., Professor of Metallurgy at the Royal School of Mines, is to lecture on "Metals in the Service of Human Life and Industry" in the Carpenters' Hall, Throgmorton Avenue, E.C., on May 15, at 4.30 p.m. The lecture will be the first of a "Research and Development" series arranged by the British Science Guild, and Lord Melchett will be in the chair. Tickets (free) can be obtained from the secretary of the Guild, 6, John Street, Adelphi, W.C.2.

The Carbonization of Low Coking Coal

A Fuel Research Survey Paper (No. 26—H.M.S.O., price 9d. net) which has recently been published provides further valuable information regarding the usefulness of Northumberland coals. The paper deals with gas-making tests carried out upon the Northumberland Yard seam, and may be regarded as an extension of the laboratory examination of the Yard seam, already published, to provide information of interest to gas-works. The type of coal which is most in favour for gas manufacture is that which combines the property of giving a high yield of gas with sufficient coking power to give a strong and readily saleable coke containing only a low proportion of coke of small size. Coal of this type is not available in all districts, and the possibility of bringing coal belonging to the lignitous class into the gas-making category was one which was regarded as of considerable interest to the country in general. It was thought that, if it could be shown that the coal would behave with satisfactory uniformity when carbonized, it would, in spite of smaller yield of gas and production of a weaker coke, compete with other gas coals, particularly where accessibility made it compare favourably in price.

In order to test this belief, tests were made in comparison with "Mitchell Main Gas" nuts, which was chosen as being representative of the high-class gas coals. From the results obtained in vertical retorts it is considered that coals of the Yard type could compete with those of the fine gas coals category, provided that a higher gas calorific value than 480 B.Th.U. per cb. ft. was not required and that the price of the coal was relatively lower, to offset the disadvantage of its high moisture content. Tests in horizontal retorts confirm this opinion. The general conclusion from a short test under low-temperature conditions is that Yard coal is suitable for the production of domestic smokeless fuel in retorts of the Fuel Research Station type. The semi-coke is fairly large and reasonably strong, though the tar yield is lower than that obtainable from the most suitable coals.

American Chemical Society

The Chicago Section of the American Chemical Society has decided to award the Willard Gibbs Medal for 1933 to Prof. Richard Willstätter of Munich. The award will be made during the meeting of the American Chemical Society at Chicago in September.

American Institute of Chemists

The Medal of the American Institute of Chemists has been awarded this year to Dr. H. C. Sherman, head of the Department of Chemistry at Columbia University, in recognition of his researches on foods, and his services to the chemical profession in America. The presentation of the medal will be made during the Institute's meeting at New York in May.

The Steel Cartel

Following meetings in Brussels of the delegates of nations participating in the steel cartel, an agreement is reported to have been reached for operation for two years commencing on June 1, 1933. The period may be extended to 5 years if all the parties consent. Difficulties in regard to the fixing of quotas have not been entirely overcome, but the present agreement is understood to provide for the establishment of an international sales office in Belgium to control exports, with quotas as follows: France 20%, Germany 23%, Belgium 45%, Luxemburg 12%.

A Correction

In the article on "Chemical Applications of the Polarizing Microscope" in the issue of April 28, p. 367, on line 20, the words "less than" should be "greater than."

COMPANY NEWS

UNILEVER, LTD.

Presiding at the 5th annual meeting of Unilever, Ltd. on April 28, Mr. F. D'Arcy Cooper dealt jointly with the results and prospects of Unilever, Ltd. and Unilever N.V. The cost of raw materials had been affected by the Import Duties Act, a case in point being linseed. The 10% duty on linseed has also made it impossible for England to compete in the crushing of linseed for export, and this work had had to be transferred to Continental mills. Several notable developments were going forward abroad: a new factory and refinery had been opened near Paris and a new plant was completed and working in the U.S.A.; a new factory was being erected in Bombay, and that at Calcutta was being extended. Similar developments were proceeding in Siam, Denmark, Australia, and South Africa. The new factory at Bromborough was now one of the most modern in the world, and was beating all records for low production costs.

The companies' soap trade in the United States had beaten all records for turnover and profit, a remarkable achievement when the conditions prevailing in that country in 1932 were considered. The favourable results had enabled Lever Bros., Ltd. to increase its dividend on the ordinary shares from 10% to 15%. The profits of Unilever, Ltd. for 1932 were £1,615,603, and of Unilever N.V., Fl. 17,742,462. A final dividend is to be paid equivalent to 36 Dutch cents per share, at present rate of exchange equal to 10¼d. per share, bringing the total for the year to 1s. 8¾d., or approximately 8⅝%.

Mr. Anton Jurgens and Mr. Jacob Hartog have *resigned from the companies' directors*, and Mr. *Arthur* Hartog has been elected to the board.

GOODLASS WALL & LEAD INDUSTRIES, LTD.

The accounts of the company for 1932 show a profit of £199,268, as compared with £219,148 in the previous thirteen months. The report states that trade in paint manufacturing has been maintained at home, but there has been a shrinkage of export trade. A factory has been established in Argentina, but it is too early yet to expect a profit from this source. The ordinary dividend is at the rate of 3%, as compared with 2% for 1931. The company's investments in subsidiaries stand at £2,784,369, and in associated companies £95,531.

DUNLOP RUBBER CO., LTD.

The preliminary statement of accounts issued by the company for 1932 shows a net profit of £1,542,000, which is an increase of £361,000 compared with last year. This amount allows for the placing of £561,000 to depreciation and obsolescence, as compared with the provision of £218,559 in last year's accounts. The company proposes to resume dividend with payment of 4% on the ordinary shares. The last ordinary distribution was in 1930, when 6% was paid.

BRITISH OXYGEN CO., LTD.

The company has declared a final dividend of 3% *on the ordinary shares, making a total of 5% for the* year, as compared with a total dividend of 3% for 1931. A bonus of 1½% is also to be paid out of the balance of undivided profits.

MARKET REPORT

This Market Report is compiled from special information received from the manufacturers concerned.

Unless otherwise stated, the prices quoted below cover fair quantities net and naked at sellers' works.

The following alterations in prices are reported since the publication of the last Market Report (cf. CHEM. & IND., April 7, 1933, p. 311).

PHARMACEUTICAL AND PHOTOGRAPHIC MATERIALS

Sod. Potass. Tartrate (Rochelle Salt).—70s. per cwt. net for 1-ton lots. Crystals, 2s. 6d. per cwt. extra.

GENERAL NOTES

Official Trade Intelligence

The Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, has received the following inquiries for British goods. British firms may obtain further information by applying to the Department and stating the specific number. *British West Indies:* Tinplate, metal foil (581). *Finland:* Machinery for paper, cellulose and pulp industries (598). *Norway:* Markets for disinfectants, insecticides (F.X. 1752).

Safeguarding of Key Industries

Additional lists of articles chargeable with duty under Part I of the Safeguarding of Industries Act, 1921, have been issued by the Board of Trade, and will take effect as from May 12, 1933. These lists refer to articles under the following headings:—optical instruments; scientific glassware; scientific instruments; synthetic organic and other fine chemicals. Copies of the lists may be obtained from H.M. Stationery Office, price 2d. net.

Baird & Tatlock (London), Ltd.

A new catalogue by Baird & Tatlock, Ltd. is something of an event for those who are concerned with the management of laboratories, for this publication is one of the standard works of the laboratory bookshelf where laboratory furnishing and equipment is concerned, and is a well-used work of reference. More than the usual interest, however, attaches to the new catalogue just issued by this firm, for in place of the usual volumes, the catalogue is now published in sectional form, the sections dealing with all the sciences (with the exception of physics, which is to be published later), being housed in attractive slip-in binders. This sectional treatment has a good deal to commend it. Many laboratories will find their requirements met by one or two sections only: thus the technologist dealing for instance with oil and tar testing will find most of his needs in one concise section, whilst scientists concerned with other lines of investigation can exclude such a particularized section from their catalogues. The slip-in system also enables additions and deletions to be made easily, so that the catalogue can be kept up to date. We note with interest that several pages are provided in each section for notes: the laboratory worker will find this provision useful, and the paper is substantial and glazed, and will stand up well to the exacting conditions of laboratory usage. There are thirty-two sections in all, including a very useful one dealing under subject-headings with technical books, and a comprehensive index completes a fine well-illustrated work. The

new B.T.L. catalogue has been prepared with much thought for the laboratory worker and care for detail; it should be given a prominent place in almost every laboratory.

Modern Industrial Furnaces

The No. 7 issue of *Modern Industrial Furnaces*, the Technical House Journal of Stein & Atkinson, Ltd., 47, Victoria Street, London, S.W.1, contains a full description of the recent development of the oil-fired rotary melting furnace and its application to the production of all types of cast iron, steel, and non-ferrous castings. Reference is also made to the expeditious and efficient manner in which copper refining and the manufacture of enamel, frit, and various non-metallic substances may be carried out in the furnace. Iron-founders will find of particular interest the ability of the rotary furnace to produce at cheap cost high-grade irons of a quality unobtainable from the cupola, also the ease with which a good and regular quality iron may be obtained from a charge consisting entirely of swarf and scrap. Founders of all types will be able to obtain an interesting comparison between the new rotary furnace methods and existing crucible, air furnace, and cupola practice.

PUBLICATIONS RECEIVED

ANNUAL REPORTS OF THE PROGRESS OF APPLIED CHEMISTRY. Issued by the Society of Chemical Industry. Vol. XVII.—1932. Pp. 728. London: Society of Chemical Industry, 1933.

ALFRED MOND: FIRST LORD MELCHETT. By H. Bolitho. Pp. 392. London: M. Secker, Ltd., 1933. 21s.

CHEMISTRY TRIUMPHANT: THE RISE AND REIGN OF CHEMISTRY IN A CHEMICAL WORLD. By W. J. Hale, Ph.D. A Century of Progress Series. Pp. x + 151. Baltimore: Williams & Wilkins Co.; London: Baillière Tindall & Cox, 1932. 5s. 6d.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. Vol. XXVII, 1931. Pp. iv + 425. New York: D. Van Nostrand Co., Inc., 1932. $6.00.

I PROGRESSI DELL'INDUSTRIA CHIMICA ITALIANA NEL I° DECENNIO DI REGIME FASCISTA. Raccolta di Monografie Curata da Domenico Marotta. Associazione Italiana di Chimica, Roma. Pp. x + 550. Roma: Tipografia Editrice "Italia," 1932.

EVAPORATING, CONDENSING, AND COOLING APPARATUS: EXPLANATIONS, FORMULÆ, AND TABLES FOR USE IN PRACTICE. By E. Hausbrand. Translated from the 2nd revised German edition by A. C. Wright, M.A., B.Sc. 5th English ed., revised and enlarged by B. Henstie. Pp. xxi + 503. London: E. Benn, Ltd., 1933. 25s.

NITRO CELLULOSE LACQUER MANUFACTURE. By R. G. Daniels, B.Sc. Sectional Editor, T. Hedley Barry. Pp. xiii + 133. London: L. Hill, Ltd., 1933. 10s.

PHASE RULE STUDIES: AN INTRODUCTION TO THE PHASE THEORY. By J. E. Wynfield Rhodes, B.Sc. With an Introduction by E. L. Rhead, F.I.C., M.Sc. Pp. x + 131. London: H. Milford, Oxford University Press, 1933. 6s.

CHEMISCH-TECHNISCHE UNTERSUCHUNGSMETHODEN. BERL-LUNGE. Edited by Dr. E. Berl. Vol. IV. 8th revised and enlarged ed. Pp. xxxiv + 1123. Berlin: J. Springer, 1933. 84 rm.

TRAITÉ DE BIOCOLLOÏDOLOGIE. By W. Kopaczewski. Vol. I. PRATIQUE DES COLLOÏDES. 2nd. ed. Part IV. MESURES OPTIQUES ET DONNÉES NUMÉRIQUES. Pp. 529—786. Vol. II. BIOCOLLOIDES: ORIGINE, PRÉPARATION, PURIFICATION, PROPRIÉTÉS. Part I. GÉOCOLLOÏDES—PHYTOCOLLOÏDES. Pp. xv + 257. Part II. ZOOCOLLOIDES. Pp. 259—517. Vol. III. PHÉNOMÈNES COLLOIDAUX. Part I. PHÉNOMÈNES DE CONTACT. PHÉNOMÈNES ÉLECTROCAPILLAIRES. Pp. viii + 168. Part II. CONDITIONS D'EQUILIBRE DES COLLOÏDES. Pp. 169—363. Part III. CARACTÈRES GÉNÉRAUX DE L'ÉTAT COLLOÏDAL. Pp. 365—592. Paris: Gauthier-Villars & Cie. Vol. I, 1930. 40 fr. Vol. II, Part I—II, 1931. 40 fr. Vol. III, Part I. 40 fr. Part II. 1932. 35 fr. Part III, 1933. 35 fr.

TRAITÉ DE CHIMIE MINÉRALE. Edited by Prof. P. Pascal. Vol. IX. ETAIN—PLOMB—THALLIUM—MANGANESE RHÉNIUM—FER. By A. Bruiltet and others. Pp. xxiii + 932. Paris: Masson et Cie, 1933. 170 fr.

TECHNOLOGY OF CELLULOSE ETHERS. By E. C. Worden, M.A., D.Sc. Vol. I. HISTORICAL DEVELOPMENT OF THE CELLULOSE ETHERS. Pp. cxiii + 306. Vol. II. HISTORICAL DEVELOPMENT OF THE CELLULOSE ESTERS. Pp. cxiii + 307—1100. Vol. III. CELLULOSE ETHERS, RAW MATERIALS, AND MANUFACTURE. Pp. cxiii + 1101—1769. Vol. IV. CELLULOSE ETHER SOLVENTS AND COMMERCIAL APPLICATIONS. Pp. cxiii + 1770—2664. Vol. V. INDICES OF PATENTS, NAMES, AND SUBJECTS. Pp. 2665—3396. New York: Chemical Catalog Co. $45.00. Sole Selling Agents in the U.K.—London: E. & F. N. Spon, Ltd.. 1933. £13 10s.

WATER POLLUTION RESEARCH. SUMMARY OF CURRENT LITERATURE. Vol. VI, No. 4. April, 1933. Abstracts Nos. 386—500. Department of Scientific and Industrial Research. Pp. 109—144. London: H.M. Stationery Office, 1933. 2s.

INDEX TO THE LITERATURE OF FOOD INVESTIGATION. Compiled by Agnes E. Glennie, B.Sc. Vol. IV, No. 2, September, 1932. Department of Scientific and Industrial Research. Pp. iv + 182. London: H.M. Stationery Office, 1933. 2s. 6d.

CHEMICAL MANUFACTURERS' DIRECTORY OF ENGLAND, WALES, AND SCOTLAND, WITH SOME OF THE FIRMS IN IRELAND, FOR 1933. 65th ed Pp. 203. London: Simpkin Marshall, Ltd., 1933. 4s. 6d.

DIRECTORY OF PAPER MAKERS OF GREAT BRITAIN AND IRELAND FOR 1933. 57th Annual Publication. Pp. xv + 271. London: Marchant Singer & Co., 1933. 5s.

ILLUSTRATED CATALOGUE OF SCIENTIFIC APPARATUS AND INSTRUMENTS FOR EDUCATIONAL PURPOSES. 9th ed. Vol. I. Pp. 560. Issued by A. Gallenkamp & Co., Ltd., 1933.

LIPOIDE UND IONEN: EINE ALLGEMEIN BIOLOGISCHE UND ÄRZTLICHE STUDIE ÜBER DIE PHYSIOLOGISCHE BEDEUTUNG DER ZELL-LIPOIDE. By Prof. Dr. R. Degkwitz. *WISSENSCHAFTLICHE FORSCHUNGSBERICHTE NATURWISSENSCHAFTLICHE REIHE.* Edited by Dr. R. E. Liesegang. Vol. XXXI. Pp. xvi + 328. Dresden and Leipzig: T. Steinkopff, 1933. Paper, 18 rm.; bound, 19.50 rm.

PATENTS EXPLAINED. By H. J. W. Wildbore. Pp. 48. London: H. J. W. Wildbore, 1933. 5s.

ANNUAL REPORT AND PROCEEDINGS OF THE LINCOLN ENGINEERING SOCIETY FOR 1932. Pp. 125. Lincoln: Lincoln Engineering Society, 1933.