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## NEW BOOKS

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**The Elder Pliny's Chapters on Chemical Subjects.** In Two Parts. Edited, with Translation and Notes, by KENNETH C. BAILBY, M.A., Sc.D. (Dublin), Fellow of Trinity College, Dublin. Longmans, Green and Company, 55 Fifth Avenue, New York. Part I, 1929. 249 pp. 16 × 24.5 cm. Price, \$4.25. Part II, 1932. 299 pp. 16 × 24.5 cm. Price, \$5.00.

In an age when scientific knowledge has accumulated to such an enormous extent and when new and astounding scientific discoveries are being made at an ever increasing rate, it is easy to underestimate the scientific knowledge and intelligence of the ancients. These chapters on chemical subjects taken from the "Natural History" of Pliny should serve as an excellent corrective for any such misconception. In them Pliny describes with considerable accuracy and liveliness the properties and either the occurrence and purification, or the manufacture, of a great number of materials—for instance: salt, soda, dyestuffs, sulfur, gypsum, alum, mortar, glass, gold, silver, mercury and other metals, and a host of minerals, earths and "stones," as he called them. The prices and the relative merits of the different sources of supply are given, together with many incidental remarks which disclose the keen mind and the sturdy independence of the author.

These chapters are clearly not the work of any cloistered pedant. Indeed the translator in his Introduction tells us that Pliny was an Augur in his youth and an Admiral of the Fleet at the time of his death. His literary productions were as many and varied, for instance, as those of Priestley. Thus, in addition to the 37 lengthy books of the "Natural History," Pliny wrote a treatise on the "Art of Using a Javelin on Horseback," a "History of the German Wars" in twenty books, "Linguistic Queries" in eight books, and many others.

This is the first separate edition, in English, of these chapters. They will be of interest not only to students of the history of chemistry, but also to teachers of chemistry in general, for their perusal permits us to form a more just conception of the background of our science.

There is one minor feature which will impress the ordinary chemical reader as unfortunate, namely, the necessity of turning continually to a later section of the book to discover and to read the indispensable Notes.

ARTHUR B. LAMB

**Second Year College Chemistry.** By WILLIAM H. CHAPIN, Professor of Chemistry in Oberlin College. Third edition, revised. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1933. xiii + 374 pp. 40 figs. 15 × 23.5 cm. Price, \$3.00.

Since the first printing of the second edition of this book, the author has added a set of 200 problems, transposed the chapters on Homogeneous Equilibrium and Neutralization Indicators, brought forward the chapter on Colloids, and revised or expanded the discussion of the Solubility Product Principle,  $P_H$  and Chemical E. M. F.

This book is primarily intended to serve as the basic text of a second year inorganic course, the first course having included such qualitative analysis as the author considers desirable. This text has been, and continues to be, a pioneer in this arrangement of the chemical curriculum, and it remains one of the very best books for those who follow this arrangement.

"Second Year College Chemistry" may be acceptably employed as a guide to an elementary course in theoretical or physical chemistry for college juniors where a mini-

mum of theory has been introduced with qualitative and quantitative analysis, and where a supplementary course in physical chemistry is given.

In the opinion of the reviewer this book might find some use in supplementing or paralleling a thorough-going course in qualitative analysis, a course which realizes some of the important possibilities that have been neglected in too many courses in this subject, and omitted or inadequately developed in this text, such as, a well-organized study of family relationships through a modern periodic classification based on atomic structure, the relation of modern x-ray crystallography to the nature of solids and solutions, and the significance of different types of valence; the ion association theory, proton chemistry, and the application of these topics to the explanation of different types of reactions, especially in solution.

While commending, in general, the success of the author in preparing a text for the special arrangement of chemical courses he favors, the reviewer is critical of over-emphasis and the tendency in chemical education to introduce prematurely the study of theoretical generalizations at the expense of indispensable knowledge of the facts of chemistry, which can, in part, be acquired through qualitative analysis.

C. R. HOOVER

**Fundamentals of Physical Chemistry.** By EARL C. H. DAVIES, Professor of Physical Chemistry at West Virginia University. P. Blakiston's Son and Co., Inc., 1012 Walnut St., Philadelphia, Pa., 1932. vii + 370 pp. 78 figs. 15 × 22 cm. Price, \$2.75.

The volume is designed to serve as an introductory course in physical chemistry for second year college students having the usual amount of general chemistry and algebra. The author has not written expressly for the student intending to specialize in chemistry, but convinced of the general educational value of the subject, he has aimed to give a broad and comprehensive survey of Physical Chemistry.

The book is well written and covers a wide range of topics in an interesting manner. The objective of the author to prepare the student to understand and profit more fully from all his science courses is well attained.

The first chapters present the usual classical topics, not failing to call to attention, where apropos, the most recent advances. The two principles of thermodynamics receive too brief attention and the periodic law might with advantage have been given a more modern setting. Also the table of isotopes is that of the *Table International des Isotopes* for 1926. Considering, however, the purpose for which the book was written the author has met the very difficult task of selection of material with insight and a sensitive appreciation of the difficulties confronting the novice in science. The inclusion of photographs of a number of men of science makes a pleasing addition to this attractive book.

F. G. KEYES

**Wave Mechanics, Elementary Theory.** By J. FRENKEL. Oxford University Press, 114 Fifth Avenue, New York, 1932. viii + 278 pages. 21 Figs., 16 × 24 cm. Price, \$5.00.

This book is the first volume of a projected series of three on various aspects of the quantum mechanics; in it are presented the more elementary portions of the theory. The first chapter contains a very suggestive and interesting presentation of the wave-corpuscle parallelism in the case of light, the ideas being developed on the basis of the special theory of relativity. In the second chapter these concepts are extended to matter, and the ideas of wave-packets and probability packets are developed. The third chapter treats of the motion of a particle in a field of force. This includes the

approximate solution of a number of one dimensional problems using the "potential-staircase method," in which the actual potential energy is replaced by a simplified potential field. Unfortunately (in the opinion of the reviewer) no use is made of the Wentzel-Brillouin-Kramers approximation method. Chapter III also includes a discussion of transition processes and of electron spin—both rather cursory, as these topics are to be taken up in more detail in later volumes. The latter half of the book is concerned with the motion of systems of particles. The fourth chapter gives an illuminating discussion of this topic from the point of view of the wave mechanics; it leads naturally to the next chapter on statistical mechanics. It should be remarked, however, that the argument of §22 of Chapter IV is not entirely general. The symmetry of  $\psi\psi^*$  (top of page 173) will be preserved if a change of particles changes the wave function  $\psi$  into its conjugate complex  $\psi^*$ , a possibility which is ignored in the discussion. In the last chapter the previously developed principles of statistical mechanics are applied to the theory of electrons in metals. In reading this chapter one is particularly struck with the difference between Frenkel's viewpoint and that of other authors. Much of the development of this chapter is, indeed, the original work of the author, and while one may be inclined to question some of the details, there is no doubt in the mind of the reviewer that the author's point of view is of great interest and value, and it does not appear to have received as much attention from workers in this field as it should have. The reviewer may parenthetically remark, however, that he cannot agree to the validity of the author's treatment of the work function of the metals, it being based on a relation between the electrostatic energy per electron, or per atom, of the whole metal and the work necessary to pull an electron out of the metal, which the reviewer does not believe to be justified.

The unusual point of view and method of presentation, which we have remarked as being particularly characteristic of the last chapter, is by no means confined to that chapter; it runs through the book and makes it particularly stimulating reading. The author always tries to throw light on the various topics presented by viewing them in several different ways. The reader thus sees that the theory is not in a finished state, and is stimulated to think about it. In general, the author tries to show something of the reasoning by which the various results have been obtained, and he often presents partially correct deductions before giving the final one. The beginner should perhaps be warned not to stop when he has read only part of what the author has to say on any subject.

Altogether, the book is one to be heartily recommended, not only to the beginner in the field, but also, and perhaps rather, to those who already have some knowledge of it, which they wish to deepen and broaden.

O. K. RICE

**Thermostatica. (Thermostatics.)** By Prof. Dr. J. E. VERSCHAFFELT, Hoogleraar te Gent. "De Sikkel," Antwerpen, Belgium; P. Noordhoff N.V., Groningen, Holland, 1933. xvi + 472 pp. 16 × 23.5 cm.

The subject matter of this textbook covers the field of thermodynamics for which the author prefers the more correct though rather uncommon name of thermostatics, relegating the term thermodynamics exclusively to heat transfers in *irreversible* changes of state. The text is divided into seven parts under the headings: (1) states of matter and changes of state, (2) the energy law, (3) the entropy for reversible changes of state, (4) the entropy for irreversible changes of state, (5) the free energy and the thermal potential, (6) physical equilibria and transformations in mixtures and (7) chemical transformations and equilibria. The discussion is clear, concise and comprehensive. The lack of references to the literature and the absence of an index are defects which will

no doubt be corrected in subsequent editions. It is regrettable but probably unavoidable that the author, while on the whole adhering to the custom of European writers on thermodynamics, uses his own system of symbols and nomenclature. Of all the scientists who have made use of Gibbs' monumental contributions to thermodynamics, only his Dutch contemporary van der Waals uses the same symbols for the characteristic functions,  $\epsilon$ ,  $\eta$ ,  $\chi$ ,  $\psi$  and  $\zeta$ . Verschaffelt, though a follower of the Dutch school, uses the corresponding notations  $U$ ,  $S$ ,  $W$ ,  $F$  and  $H$ . The function  $F$  is designated, after Helmholtz, as "free energy" while Lewis' free energy ( $H$ ) is called "thermal potential."  $W$  stands for "enthalpy," sometimes spoken of as "heat content" or "total heat" in English and American publications. Although the contributions of German, English, French and American writers are freely quoted, it is only natural that the author devotes considerable space to the notable work of van der Waals and his co-laborers. The applications of thermostatics to chemical equilibria are limited in number but there can be no doubt that any student of physical chemistry who wants to broaden his outlook will profit by a thorough perusal of the text. This book was written to supply the needs of advanced students of mathematical physics and physical chemistry at the only Flemish university in Belgium and is, to the reviewer's knowledge, the first comprehensive treatise in Dutch on thermodynamics. If written in English the text would be of considerable value to English speaking students and it is hoped that the author may, some time, persuade one of his pupils to undertake an English translation.

H. S. VAN KLOOSTER

**Organic Chemistry for Medical Students.** By GEORGE BARGER, M.A., D.Sc., F.R.S., Professor of Chemistry in Relation to Medicine in the University of Edinburgh. Gurney and Jackson, 33 Paternoster Row, London E.C., England, 1932. xi + 249 pp. 14.5 × 23 cm. Price, 12/6, net.

The circumstance that medical students in the United States have already completed their study of organic chemistry *per se* before entering the medical school, taken in conjunction with the title of this book, is sufficient evidence that there is some difference of opinion within the limits of the English-speaking world as to when and how the subject should be taught to the prospective doctor. The same circumstance inevitably restricts the demand for textbooks of this type in America, but does not in the least alter the fact that Professor Barger's book is a model of its kind. To say merely that it is readable and clearly written is inadequate; the question is whether in that respect it could be improved upon.

Very few typographical errors can be found (*e. g.*, *flour* for *floor* on p. 14), and statements to which exception might be taken are not much more numerous. The brief discussion of methods for the determination of sugar in blood (p. 119) is in part misleading, and something appears to have gone wrong on p. 217, and again on p. 219, for in both places uric acid is said to be converted into urea in lower mammals.

As might be inferred from the above, the book contains no reference to allantoin. All told, a score or more of equally important omissions have been made. Since a book of this character is chiefly useful as a preliminary to a course in animal biochemistry, some mention at least of all comparatively simple organic compounds likely to be encountered in such a course might reasonably be looked for.

In other respects the choice of subject matter is superlatively good. The book can be highly recommended as a text where the subject must be covered in the shortest possible time as part of a crowded medical curriculum. Its scope is, however, too restricted for use in courses in organic chemistry of the kind required for admission to the better medical schools in this country. American medical students may nevertheless in some instances find it of value as a means of brushing up their organic chemistry, or

that part of the subject which will be immediately useful to them in connection with their didactic work in biochemistry.

CYRUS H. FISKE

**Tannin, Cellulose, Lignin.** (*Tannin, Cellulose and Lignin.*) By Dr. K. FREUDENBERG, Professor at the University of Heidelberg. A second edition of "Chemistry of Natural Tanning Materials." Verlag von Julius Springer, Linkstrasse 23-24, Berlin W 9, Germany, 1933. iv + 165 pp. 14 figs. 17 × 25.5 cm. Price, RM. 8.80.

This treatise is concerned essentially with the fundamental researches carried out by the author and co-workers on the above subject during the last twenty years and the more than one hundred literature references bear witness to Professor Freudenberg's activity and outstanding contributions in these fields.

The student concerned with the developments leading to the establishment of the structural formulas of the natural tannins will find here an excellent and up-to-date account of his work and will be interested in the possible relationship of the tannins to lignin and cellulose as indicated by the author.

The space devoted to cellulose is confined essentially to the author's admittedly outstanding contribution in this field with the consequence that much important work bearing on the establishment of the structure receives little or no consideration.

In the final section of the book Professor Freudenberg gives an account of his researches on lignin and attempts to establish a structure for this very elusive substance. In the reviewer's opinion the conclusions drawn are to be regarded as decidedly problematical and lacking, as yet, the customary rigid, scientific, experimental proof.

The reader interested in obtaining a concise account of the author's valuable accomplishments in the fields indicated will be grateful to him for the opportunity provided in the present volume.

HAROLD HIBBERT

**Chemical Embryology.** By JOSEPH NEEDHAM, M.A., Ph.D., Fellow of Gonville & Caius College, Cambridge, and University Demonstrator in Biochemistry. In three volumes. The Macmillan Company, 60 Fifth Avenue, New York, 1931. 2021 pp. Illustrated. 16.5 × 24 cm. Price, \$35.00.

This scholarly and impressive work in three large volumes attempts and achieves for the first time, so far as I am aware, a thorough presentation of the present knowledge of embryology from the point of view of the chemical changes involved. It should be of the greatest value to the investigator in this field and to the general scientific reader who may wish to secure a broad and yet thorough knowledge of the chemical aspects of embryology.

It will be of special interest to chemists in two respects. First, it shows how important have been the contributions of chemistry to the development of embryology; or expressed in a different way, it demonstrates in a striking fashion the fecundity of the union of the two sciences. The following remarks of the author in his "Prolegomena" in this connection are both interesting and enlivening:

"The Sciences, unlike the Graces or the Eumenides, are not limited in number. Once born, they are immortal, but, as knowledge increases, they are ever multiplying, and so great is now the dominion of the scientific mind that every few years sees a new one brought into the world. Some spring, fully armed, from the brains of one or two men of genius, but most of them, perhaps, come only gradually to their full development through the labours of very many obscure and accurate observers.

"If the analogy may be permitted, physico-chemical embryology has so far been living an intra-uterine existence. Its facts have been buried in a wide range of scientific journals, and its theories have lain dormant or *in potentia* in reviews of modest scope. Physico-chemical embryology has, indeed, arrived at the stage immediately prior to birth, and all it needs is a skilful obstetrician, for, when once it has reached the light of day and has passed for ever out of the foetal stage, it will be well able to take care of itself. This obstetrical task is that which I have chosen and obviously enough it divides into three principal heads: first, to collect together out of all the original papers on the subject the facts which are known about the physico-chemical basis of embryonic development; second, to relate these facts to each other and to the facts derived from the labours of investigators in morphological embryology and 'Entwicklungsmechanik,' and, third, to ascertain whether, from what is at present known, any generally valid principles emerge."

Second, it shows, in its excellent chapters on the history of chemical embryology, that even at the outset chemistry and embryology were closely interconnected both as to subject matter and as to personalities. Thus the chemist will find among contributors to this field such familiar personalities as Albertus Magnus, Robert Boyle, John Mayow and Hermann Boerhaave. Clearly the achievements of these men usually thought of as chemists cannot be properly appraised unless all of their activities are considered.

The first volume, in addition to the history of chemical embryology already mentioned, discusses also what might be called the philosophy of the sciences of chemistry and embryology. It then presents a general discussion of chemical embryology under the heading of The Unfertilized Egg; (1) as a physico-chemical system, (2) its increase in size and weight, and (3) its increase in complexity and organization.

The second volume discusses the respiration and the heat production of the embryo; biophysical phenomena in ontogenesis, and in some 400 pages the metabolism of the embryo from the point of view of its most important chemical constituents.

The third volume discusses the functions of enzymes, hormones, vitamins and pigments in ontogenesis; resistance, susceptibility, serology and immunology in embryonic life, and finally the biochemistry of the placenta, and the blood tissue of the embryo.

In this monumental work the author has marshaled a colossal array of facts into an interesting, suggestive and readable treatise.

ARTHUR B. LAMB