Book Reviews

Gas Chromatography. A. I. M. Keulemans. Reinhold, New York, 1957. xix + 217 pp. Illus. $7.50.

In the last few years, the technique of gas chromatography—that is, the chromatography of volatile substances in which a permanent gas is used as the moving phase—has grown very rapidly. It is becoming standard in many laboratories, both industrial and academic, as a means of analysis of volatile mixtures. Of late, several manufacturers of scientific apparatus have produced gas chromatography machines that join the ranks of the magic black boxes which form the physical analyst's stock-in-trade.

In view of the rapid rate of growth of the subject at present, A. I. M. Keulemans' book should be very valuable. After an initial chapter in which gas chromatography is compared with similar analytic methods, there is a chapter outlining the apparatus used in its technique and the way in which it will perform both qualitative and quantitative analysis. Several examples from the published literature are quoted, displaying practical analyses. In the third chapter, the components of the apparatus are described in greater detail. These three chapters give the basic outline of the subject. The book then continues in greater detail, presenting a theory of the chromatographic process, which is developed into a discussion of the design, construction, and performance of gas-chromatographic columns. The discussion is extensively illustrated from practice and gives much information which makes it possible to use the technique in the most effective manner.

The book is a textbook rather than a comprehensive treatise. The material discussed has been selected with regard to its importance and is particularly valuable to those who use commercial instruments. Nine-tenths of the book is devoted to the gas-liquid partition chromatography of Martin and James, while there is only a short section on gas-solid adsorption chromatography, which is at present rather overshadowed by the other. The treatment of the theory of the column and its operation is much more detailed than the description of the apparatus. This is inevitable, since the design of the apparatus is so diverse and is developing so rapidly, whereas the theory will, it is presumed, remain invariable.

Keulemans is associated with the Shell Oil Company, whose work in this field is outstanding. He has drawn extensively on Shell work, and in places where views might be controversial, he voices those of Shell workers. The accent throughout is on the use of the technique in the oil industry. Certainly, to date, the method has been of the greatest value in this industry, and the oil companies have done the greater part of the development. However, it should be emphasized that the technique is of general application to anything volatile, and this book should be of great interest to anyone who feels that he should know about the analysis of any volatile mixture.

A. B. LITTLEWOOD
Newcastle upon Tyne, England

The Calculation of Atomic Structures. Based on lectures given under the auspices of the William Pyle Fund of Haverford College, 1955. Douglas R. Hartree. Wiley, New York; Chapman & Hall, London, 1957. 181 pp. Illus. $5.

This book has been written in response to a recent revival of interest in the results of calculations of atomic structures and of methods of carrying out such calculations. This interest has been quickened by the rapid development of automatic digital computing machines and methods, which will make atomic structure calculations easily practicable on a much more generous scale than before and over a much greater range of cases (notably, for heavier atoms). The book "is intended for those who want to know about, or to carry out, quantitative calculations of atomic structure" to the degree of approximation embodied in wave functions of the "self-consistent field" type, using the methods developed by Hartree and Fock. The book makes no attempt to deal with the more detailed features of atomic energy states, such as multi-plet structure, hyperfine structure, or the effects of external fields.

The first three chapters comprise a brief introduction, a discussion of the application of the variation principle to atomic structure, and the derivation of basic equations for the computation of atomic wave functions and energies in the self-consistent field approximation for closed-shell atomic states ("configurations of complete groups").

Chapters 4 and 5 describe, in considerable detail, numerical procedures for the solution of the self-consistent field problem in the closed-shell case, and their application. The book as a whole, and these how-to-do-it chapters in particular, for the first time bring together in one convenient place the fruits of the author's long experience in hand computations with the self-consistent field method. All the most recent improvements in technique through 1956 are included. Chapter 6 extends the discussion of chapters 3 through 5 to configurations comprising incomplete groups. The possibility that modified techniques or approaches may be more suitable in digital computer programming is considered very briefly, but actual methods of implementation of machine computations, already under way in two or three places, are not discussed.

Chapter 7 is designed to fill the need for the best possible procedures for interpolation between cases of atoms or ions for which self-consistent field calculations have been made. (For example, if self-consistent field wave functions were known for Si and S but not for P, one might estimate those for the latter by interpolation.) At the present time, such interpolation procedures are needed because not much more than a sampling of all cases of interest has been carried out, except for the lightest atoms. They are needed for either or both of two reasons: (i) for the calculation of atomic properties, in lieu of wave functions computed directly by the self-consistent field method; (ii) for use as initial estimates in making self-consistent field calculation, since the effort of making such a calculation can thereby be greatly reduced. Various useful curves, diagrams, and (in Appendix 2) tables are included.

Chapter 8 sets forth methods for computing the energies, in particular of levels differing in the number or state of excitation of outer electrons, when self-consistent field wave functions are known. Chapter 9 briefly surveys how the self-consistent field calculations may be extended to take account of relativistic effects.

Chapter 10 is an up-to-date critical brief review of methods of obtaining better approximations to atomic wave

functions than are afforded by the self-consistent field method. The familiar "two kinds of improvement" to give needed electron correlation—namely, by configuration mixing and by explicit use of the interelectronic distance as a variable—are considered; after this there is a small section on polarization.

Appendix 3, added in October 1956, comprises notes and references to bring the earlier material up to date. Although the book itself deals with self-consistent field methods and not with results, Appendix 1 gives access, through a reference list, to all self-consistent field results published up to late 1956.

Douglas Hartree's small book will be a valuable reference source for those wishing to make self-consistent field calculations and will also be useful in its up-to-date references to self-consistent field theory and results and to related matters.

ROBERT S. MULLIKEN
University of Chicago

Mammals of the Great Lakes Region.
W. H. Burt. University of Michigan Press, Ann Arbor, 1957. 248 pp. Illus. $4.75.

Mammals of the Great Lakes Region is a revision of the author's *Mammals of Michigan*. It includes the natural area of the Great Lakes drainage. Since plants and animals are no respecters of political boundaries, W. H. Burt has wisely chosen a natural area that takes in the watershed of these five lakes. Parts of eight states and Ontario are included. Wild mammals are difficult to study. For the most part, the smaller species are secretive and nocturnal; the larger forms, too, are difficult to observe. The author has introduced the known facts in a succinct manner, including not only his own great knowledge of mammals but that of others in the field.

Presenting some principles of adaptations, home range, populations, and so forth, Burt treats the 78 species and three recently extinct forms in admirable style. A short description, habits, and the known geographic range are documented for each species. Stylized sketches by the author help to identify the genus.

For each species there is a distribution map, which gives the present known range of the species within the area discussed. Unlike the ornithologist, the student of mammals must trap continuously to secure data on distribution and life-history of the smaller mammals. Too often it is a frustrating chore.

A summarized table includes data on the tooth formula, measurements and weights, gestation, number of young and litters, longevity, and home range. Se-

lected references, both general and specific, provide a source for the reader who may wish to pursue the subject further. The book will serve the amateur and professional naturalist alike.

W. J. HAMILTON, JR.
Cornell University

Notions de Cytologie et Histologie. M. Chèvremont. Desoer, Liége, 1956. iv + 994 pp. Illus. + plates.

This impressive volume differs from other textbooks of histology mainly in its first section, on the cell, which, together with an introduction on history, methods, and techniques, covers 286 of the 994 pages. In this section the structure, cytochemistry, and biological significance of the cell and its constituents are unusually well and thoroughly presented. Concentrating on the cells in higher vertebrates, Chèvremont nevertheless succeeded in unfolding the entire aspect of present-day cytology, thereby producing not only an excellent introduction for students but also a highly informative and stimulating treatise for the workers in the field. To give a randomly chosen example, one finds not only a report on the antimitotic substances and their particular effects but also a discussion of their significance for the analysis of mitosis. Another example to indicate the broad and well-balanced presentation is the consideration of the profound physical changes that occur in the cytoplasm during mitosis, in spite of the greater stress present cytology must place on the chemical and metabolic changes. A third example is a brief and well-designed chapter devoted to the part that cytoplasmic constituents may play in heredity.

Although the second section, on tissues, is traditional in the descriptions of epithelia (including glands and secretion in general) and connective tissue and its derivatives (including blood and muscle) and nervous tissues, it is consistent with one of the main tendencies of the book in that it states the problems of histology against the background of biology. This is emphasized by an introductory chapter on cell differentiation and specificity, which deals with the relationship of histology to embryology, to experimental biology, and to tissue culture. One may wonder here why growth and morphogenesis were not also considered. For each tissue the data on histogenesis, histophysiology, and histochemistry are presented.

The third section, on cell systems, apparatus, and organs, is in no way deprived of its fair share of attention by the elaborate presentations of the cell and the tissues. Except for the chapters

on the nervous system and the sense organs, which give the impression of being appendixes rather than full-grown parts of the whole, there is adequate information on microscopic anatomy. The broad biological and functional approach was maintained throughout the special parts; a chapter such as that on the "Système histiocytaire" (18 pages), preceding the description of blood-forming organs, is especially characteristic of Chèvremont's high standard of teaching. Embryology, innervation, and blood supply are discussed for each organ, and separate sections on histophysiology (which cover four and a half pages for the lung, five and a half pages for the kidney, and four pages for the liver) emphasize the functional significance of the microscopic structures.

The volume is well and amply illustrated with about 300 microphotographs, several electron micrographs and diagrams, and ten plates of about 30 colored pictures. A subject index of 30 pages facilitates the use of the book and shows the wealth of information it has to offer.

Numerous references at the end of paragraphs, in footnotes, and in the text keep the reader up to date on the literature and serve to stimulate discussions and develop controversial points instead of presenting them in definite form. Early sources of our knowledge are referred to in the reviews on the history of a particular line of research. Since Giuseppe Levi's *Trattato Istologico* is the great European standard work, where additional information can be found, it seems unfortunate that the third edition (1946) is listed instead of the fourth (1954).

The volume is written in simple, lucid, and precise language, and it should be easily read even by those with a limited knowledge of French.

F. WASSERMANN
Argonne National Laboratory

A Manual of Pharmacology and Its Applications to Therapeutics and Toxicology. Torald Sollmann. Saunders, Philadelphia, Pa., ed. 8, 1957. 1535 pp. $20.

Just 40 years ago, the first edition of Sollmann was published and immediately became the major American textbook in pharmacology. Seven new editions have now followed the first. During these years, at least two other comprehensive textbooks have appeared —Goodman and Gilman, now in its second edition, and the recent composite volume edited by Drill—and other only slightly shorter volumes, like that of Krantz and Carr. These illustrate the in-