would provide, in themselves, a valuable reference book.

The range of subjects treated is remarkably complete, reminiscent of the "German handbook" tradition. In addition to the subjects already mentioned, others of particular interest are the treatments of integral equations, the diffusion equations, and the equations for vector fields. The only obvious omission is a lack of emphasis on algebraic methods. The correspondence of matrices with operators is mentioned, but there is no discussion of the group theoretical methods that have found extensive applications in problems related to crystals, molecules, and atoms.

The authors indicate in the preface that the book is an outgrowth of a course given at the Massachusetts Institute of Technology, and numerous problems are included whose solution by the reader would aid materially in his understanding of the subject matter. It seems improbable, however, that these two thick volumes can serve as a textbook in a graduate course of the usual extent. One could imagine that a first-class student, by devoting his full time to it, might work through the material in the course of an academic year but probably in not much less. Although its use as a textbook in the usual way seems doubtful, there is no doubt that this book will occupy a prominent position on the desks of almost all working theoretical physicists and will soon come to be the standard reference work for the mathematical techniques in physics.

W. V. HOUSTON

*The Rice Institute*

***Les Groupes Sanguins Chez les Animaux.*** Individualités sanguine et tissulaire. R. Dujarric de la Rivière and A. Eyquem. Editions Médicales Flammarion, Paris, 1953. 407 pp. Illus. F. 3275.

The predominant tone of this ninth member of the *Collection de l'Institut Pasteur* is that of an encyclopedia of observations on animal blood groups and tissue individuality. As such, the book provides a useful set of summaries and references. If one wishes to know what conclusions have been drawn from blood-group studies of ducks, chickens, pigeons, horses, asses, cattle, sheep, goats, swine, cats, ferrets, dogs, rabbits, guinea pigs, rats, or monkeys, he will find almost all of them here. If one is curious about the existence or nature of maternal-fetal incompatibility in animals, he will find an exhaustive abstract of the literature. If one seeks a strong historical presentation of tissue specificity, particularly from the viewpoints of "cytotoxic antibodies" or of grafts, he will find many references and conclusions in this survey. About two-thirds of the text pages and most of the more than 850 references deal with these subjects. The authors rarely attempt more than the presentation of conclusions drawn in the papers to which they refer.

The references are marred by frequent typographical errors. To cite only a few examples, T. H. Morgan is credited with work done by W. T. J. Morgan; W. H. McGibbon is Mac Gibbon in much but not all the text, and Gibbon (Mac) in the bibliography; Beadle becomes "Beadie," and sex chromosomes "sex hormosomes"; Wiener's *Blood Groups and Transfusion* was published in 1945 or 1948 depending on where it is found in the references.

Broader aims for the book are expressed in the first 122 pages, which offer general treatments of serology and genetics and a detailed presentation of serological techniques, with primary reference to work on human cellular antigens. The general fields are covered in a fashion that seems likely to irritate the expert and either confuse the novice or mislead him into an opinion that he has achieved an easy mastery of these subjects. After a 16-page presentation of genetics, there are more than two cautious pages on the "Théorie de Mitchourine." The authors choose not to discount the interest provoked by the Russian theory, especially in its application to arboriculture, but to affirm the value of the "chromosome theory of heredity."

RAY D. OWEN

*Kerckhoff Laboratories of Biology, California Institute of Technology*

***Automatic Digital Calculators.*** A. D. Booth and K. H. V. Booth. Academic Press, New York, 1953. vii + 230 pp. Illus. + plates. $6.

It has been predicted that we are now entering a new phase of the Industrial Revolution wherein machines will relieve men of tedious and difficult mental labor, just as they relieved men of tedious and difficult physical labor during the first phase of the Revolution. Whether or not such a prediction is accurate, it certainly is true that there is today a great need for scientists with some knowledge of the design and use of automatic digital calculators. There is a corresponding need for a good textbook to be used as an introduction to the subject, and the authors state in the preface that they intend their book to be such a guide.

The general organization is excellent. The first three chapters review the history of digital calculators and examine many of the machines now in existence. The following chapters, which comprise more than half of the book, list the basic electronic and mechanical components from which a computer is built and describe how the components are put together in a computing system. In the last five chapters, the authors explain how problems are prepared for solution by a computer, and mention some unusual computer applications.

However, it is difficult to recommend as a textbook one that omits so many important points and differs in so many respects from current practice. The chapters on circuit design do not even mention the importance of reliability or the steps that must be taken to insure circuit stability. The use of mathematical techniques in logical design is ignored. To this partial list of omissions must be added incorrect statements and some dubious and controversial arguments. It is

not correct that ". . . negative numbers are invariably stored in complement form" (p. 44). One chapter on coding attempts to justify the use of interpolation techniques in the evaluation of basic functions, although this method is not adequately compared with others that are more widely used. A statement that will provoke considerable argument is made on page 169, where the authors declare that floating-point subroutines ". . . should be regarded as a last resort rather than as an easy alternative to careful planning."

In short, although this book probably covers the field better than any existing volume, it can be recommended as a textbook only if it is to be supplemented and corrected by someone who is well acquainted with the art of automatic computing.

MONTGOMERY PHISTER, JR.
*Hughes Research and Development Laboratories*
*Culver City, California*

***Microwave Spectroscopy.*** M. W. P. Strandberg. Wiley, New York; Methuen, London, 1954. vi + 140 pp. Illus. + plates. $2.50.

Microwave spectroscopy had its origin about 20 years ago, but its major progress has been made in the last 8 or 9 years. Along with its rapid growth, an extensive literature has appeared in periodicals. However, this volume, so far as I know, is one of two books (my review of the other appears in the next column) written on the subject

*Microwave Spectroscopy* by Strandberg deals, in the words of the author,

> . . . with a calculation of the quantum energy levels of a rotating molecule, and considers the various perturbations which may or must be recognized to interpret precise experimental data. The final sections deal with the instrumentation necessary to measure the frequencies in the microwave region which are characteristic of differences between these energy levels.

The book is tersely written; to read it with understanding requires an extensive background in the matrix formulation of quantum mechanics and a considerable capability in mathematics—that is, the use of tensors in the chapter on nuclear quadrupole energy. The chapters on experimental considerations are likewise compact and assume familiarity with microwave techniques. A brief bibliography and three appendixes conclude the book. Appendixes I and II are tables of reduced energy and line strengths, respectively. Appendix III gives rotational magnetic moment matrix elements on the space-fixed Z(M) axis.

It seems to me that there might be many readers surveying this important field who would be discouraged from completing a study of this book because of the condensed manner in which it is presented. But Strandberg makes no particular claim that this is the group to whom he is appealing. There is no doubt that anyone who desires to do research in the field of microwave spectroscopy must master the theory outlined in this scholarly work.

***Microwave Spectroscopy.*** Walter Gordy, William V. Smith, and Ralph F. Trambarulo. Wiley, New York; Chapman & Hall, London, 1953. xii + 446 pp. Illus. $8.

The preface of this book states that the understanding of microwave spectroscopy requires knowledge of several branches of theoretical physics, chemistry, electronic circuitry, and microwave components. The aim of the book is to provide a convenient source of information on the significant spectroscopic components and a survey of the theory fundamental to understanding this important field. This aim, in my estimation, is successfully accomplished. The contents include information on instruments and experimental methods, microwave spectra of gases, solids, and liquids, the Stark and Zeeman effects, molecular structures, and a variety of other topics. Numerous photographs, charts, graphs, and circuit diagrams enhance the value of the book.

This book was not written primarily as a textbook, but because of the clarity and detail with which much of the material is presented, it might be useful as such.

There is a long list of pertinent references at the end of each chapter, and the book closes with a chronologically arranged bibliography of important published papers on the applications of microwave spectroscopy to gases, paramagnetic resonance of solids and liquids, and ferromagnetic resonance. This should be of great value to anyone who has to search the literature for specific information. The appendix contains an extensive tabulation of data useful to the worker in this field. This volume should be of considerable value to students and research workers in this field.

CLAYTON M. ZIEMAN
*Department of Electrical Engineering,*
*USAF Institute of Technology, Air University,*
*Wright-Patterson Air Force Base, Ohio*

***The Metabolism of Algae.*** G. E. Fogg. Methuen, London; Wiley, New York, 1953. ix + 149 pp. Illus. $2.

This brief book attempts to cover the biochemistry of a very large group of diverse plants, ranging from unicellular forms closely related to bacteria to the seaweeds of commercial importance. It is evident that the available knowledge varies widely from one organism to another. Certain unicellular species that for technical reasons are suitable for studies of photosynthesis are well known from the point of view of intermediary metabolism. In contrast, the seaweeds have been of interest primarily from the point of view of the end-products of metabolism, such as the polysaccharides.

Chapters are devoted to the photosynthetic and