(who might have some difficulty recognizing his child) of the nondirective therapy which is the accent of the moment in a good many of our university departments of clinical psychology.

KEITH SWARD

Beverly Hills, California

The physical principles of wave guide transmission and antenna systems. W. H. Watson. Oxford, Engl.: Clarendon Press, 1947. Pp. xiii + 208. (Illustrated.) $7.00.

This book is an advanced text intended for the research engineer or physicist who is specializing in the subject of microwaves. A very good background in mathematics is necessary in order to understand the book fully. However, the author has included much information which is the result of practical experience in the field.

In the early chapters the author reviews the basic equations of plane wave, slab line, and rectangular wave guide transmission. Matrices are used extensively throughout the book in an effort to simplify the mathematics.

In Chapter III there is a practical discussion of microwave measurements.

Babinet's principle is used as a basis for computing the effect of obstructed propagation in wave guides. Gratings, irises, slots, and other discontinuities which are found in wave guide work are all treated in considerable detail. The author has devoted much space to an excellent treatment, both theoretical and practical, of various types of slots in wave guides, guide coupling by slots, and wave guide arrays. Wave guide slot arrays were a wartime development of McGill University, where the author was working. Cavities, phase changers, magic-tees, and some more of the later developments in microwave work are touched upon.

The book makes a real contribution to the microwave field in that it will do much to bring the research worker up to date in several phases of microwave techniques.

LA VERGNE E. WILLIAMS

University of Connecticut, Storrs

Basic botany. Fred W. Emerson. Philadelphia-Toronto: Blakiston, 1947. Pp. xi + 372. (Illustrated.) $4.00.

This is a refreshing new textbook of elementary botany which continues the recent trend away from the ponderous and sometimes pedestrian tomes characteristic of so many books for students. The departure from the conventional starts with the cover, which is a landscape scene in color from New Mexico or vicinity. The arrangement and treatment of the subject matter, while not so startling, is sufficiently different to be challenging to those familiar with the more orthodox texts. The author's style is fresh and unstilted, the illustrations adequate and often admirable, and the scope the usual one of morphology, physiology with chapters devoted to genetics and evolution, plus excellent sections on plant classification, ecology, and conservation.

Criticism of the text can be made on two minor points. The author plainly considers evolution to be a law, as it is, but persists in calling it a theory. The other criticism is directed at the drawings of mitosis, in which there appears a spindle figure in prophase, an error perpetuated in most botany texts, diagrams, and charts. In the excellent text description of the process, however, no mention is made of the appearance of a spindle before the disappearance of the nuclear membrane. In the preface, the author states as his conviction that both students and teachers learn, study, and investigate under the drive of significance, and that freshness and spontaneity should characterize the atmosphere of classroom and laboratory. It is good to hear of a botanist who believes in his subject, and one finds in this book none of those desperate attempts to justify the business usually entitled 'why study botany.' Those who confuse measured monotony with scholarship will probably not like this book.

EARL H. NEWCOMER

University of Connecticut, Storrs

Physical chemistry. E. D. Eastman and G. K. Rollefson. New York-London: McGraw-Hill, 1947. Pp. viii + 504. $4.50.

This text is "designed to meet the requirements of the year course in physical chemistry usually presented to third- or fourth-year college students and to serve as a reference book in later work." The authors have written for mature students and have, I think, achieved their purpose admirably.

Three introductory chapters explain the objectives and methods of physical chemistry and define such terms as *system*, *conditions*, *potentials*, *components*, *changes in state*, etc. This should give the student a perspective that often comes only after the course is nearly over; as a preview, these chapters evince a keen pedagogical insight. The range of topics in the remaining 23 chapters is fairly conventional, but the rigorous treatment and fine writing give them an unusual vitality. For example, Chapter IX, "Energy and Heat Capacity of Gases and Crystals," is a well-integrated account of classical and modern views ranging from the work of Clément and Desormes in 1819 to Raman's contributions in 1941. In Chapters VIII, X, and XII are presented the current ideas on the structure of solids and liquids; although these 68 pages are mostly descriptive, they have a high intellectual specific heat. The important chapters on thermodynamics, equilibrium, and kinetics are remarkably free of that most common fault of elementary texts—the failure to distinguish between exact and approximate relationships. An example of this kind of error occurs in applying the First Law to processes taking place under constant pressure or constant volume. The authors distinguish the energy changes by the use of subscripts in the terms ΔE_p and ΔE_v, but this distinction is subsequently ignored in the statement (p. 45) that the difference between the heats of reaction at constant pressure and at constant volume is always calculable from the equation: $\Delta H_p = \Delta E_p + P\Delta V$. Although $\left(\frac{\partial E}{\partial P}\right)_T$ is relatively small, thermochemists do measure it, and it is unfortunate that nearly every popular text treats this fundamental subject incorrectly. A similar oversimplification occurs in Chapter XXI, where the equilibrium constant for the reduction of ferric iron by iodide is calculated from electromotive force data. It should be emphasized that, in actual systems encountered by the student, the presence of phosphates or fluorides can result in the quantitative reversal of the equilibrium predicted. Later in the same chapter, a beautiful graphical picture of the effect of ionic strength on a similar equilibrium of ferric-ferrous iron should make the alert student ask questions about the former.

On the other hand, we can easily find many places where the authors show exceptional care. In discussing the hydrolysis of bicarbonate ion, they point out that either of the simplifying assumptions made in calculating the pH gives an answer far different from the experimental value. By any standards this text should join the highest rank of its kind. The content of the book reveals a mastery of the subject, and the style in which it is written reveals the beauty. The typography is excellent, but the thin paper will probably not stand hard use.

ROBERT EPPLE

Brown University

Electric contacts. Ragnar Holm. Stockholm: Almquist & Wiksells, 1946. Pp. xvi + 398. (Illustrated.) 45:-.

Electric contacts have an important role in modern living. However, the physical principles of contact phenomena have not been correlated fully with experimental data. Present knowledge is confined largely to well-guarded production techniques and empirical formulas that the industry has amassed. This book is an attempt to describe in general terms the physics of contacts and to develop fundamental formulas in agreement with data taken by the author and colleagues over a period of some 20 years.

As noted in the text, the book was written while the author was a physicist in the Research Laboratory of the Siemens Works in Berlin, one of the outstanding industrial laboratories on the continent between the first and second World Wars. Translation of the book into English introduced some minor errors in spelling and terminology, but these in no sense lessen its technical value.

The style used by the writer is a balance of thoroughness and clarity. He begins with a complete list of symbol definitions and a qualitative résumé of the major conceptions used throughout the work. Such an introduction is necessary, because many of the symbols and terms used either have not received universal recognition or are used here to introduce new concepts, e.g. "constriction resistance" and "coherer action."

Stationary contacts are considered in Part I. The general theory of contact surfaces and contact resistance is treated in some detail. This is followed by a theoretical analysis of the interrelation between electric potential differences, temperature gradients, and impedance in contacts. The role of electrodynamic and electrostatic forces is outlined. The influence of pressure and tarnish films on contact resistance is carefully described. Tables and plates are interspersed that in the main confirm, but at times are not in full agreement with, the theory. The author goes to some lengths to point out that in many instances only the results of preliminary investigations are available, and that more detailed research is necessary before useful formulas can be evolved.

Part II is a study of sliding contacts. The concept of friction and its effect on contact resistance is treated in considerable detail. The relative physical properties of several combinations of contact materials are presented in detailed tabular form with a commentary on the observations.

Part III begins anew with a survey of the short switch arc, including a study of the VI-relationship, bouncing, oxidation, arc duration, and methods of quenching and suppression. The physics of contact erosion and transfer of matter are very clearly presented with substantiating data.

Part IV, a retrospect, is purely historical. Going back to the early experiments of Franklin and Leyden, it traces the evolution of the concept of contact resistance to the present day. A very complete author and literature index is included.

As a whole, the book is written on a plane that will qualify it as a reference text for graduate students in electrical engineering or as a handbook for industrial design engineers. Some parts of the text, printed in brevier, are intended primarily for the physicist and afford a prolific ground for the selection of problems for fundamental and applied research.

MERLE H. BRAGDON

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Servomechanism fundamentals. Henri Lauer, Robert Lesnick, and Leslie E. Matson. New York-London: McGraw-Hill, 1947. Pp. xi + 277. (Illustrated.) $3.50.

The fundamental principles of servomechanisms are so presented in this book as to require a minimum background in mathematics and physics. A chapter on the fundamentals of mechanics and electricity is included, and the necessary differential equations are presented and solved in detail by classical methods. Thus, considerable review of the necessary background material is provided in the book itself.

The fundamental servo control system is developed, and its essential components are pointed out. These components are an error-detecting device which compares the actual output quantity with a given input requirement, and a controller embodying the necessary amplifiers and motors to cause the output to correspond to the input requirement. The need for damping and stabilizing devices is also pointed out. The more common error-detecting devices such as synchros are discussed fully, and several examples of servo systems are given.

The transient response of various typical servomechanisms is studied by means of classical differential equations. First, a system with a proportional controller whose only damping is the viscous friction of the output member is considered. This system has the disadvantage of a steady-state error if the input is a constant velocity. This undesirable error is found to be absent if all the damping is produced in the controller by means of an additional effort proportional to the rate of change of error. Systems with error-rate damping and combined damping are then studied. Networks for producing this error-rate stabilization are also discussed. Elimination of the steady-state error by means of integral control is then discussed, and systems with integral control are studied. Networks for producing integral control are also included.

The response of servo systems to a sinusoidal input function is mentioned in various places in the text, and a chapter near the end of the book gives an introduction to the frequency response or transfer function analysis. Nyquist's stability criterion is stated, and various plots of the transfer function are given. This chapter serves as an introduction to the more advanced treatises using this method of analysis.

Although the book has many excellent solved examples and one chapter treats typical design calculations, it is felt that its value as a textbook would be increased by the addition of a number of well-chosen problems.

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