has radically changed the study and teaching of electrical engineering. Most early books on alternating current circuit theory considered the question solely from a standpoint of constant frequency and maximum efficiency, and newer texts were written for communication circuits covering the range of frequencies then in use. A still more recent development is the use of ultra-high frequencies for wave guides, radar, etc., and this calls for a still different treatment. The consequent increase in scope and amount of material in the field is being reflected even in the elementary courses. The time allotted to undergraduate preparation remains unchanged, and, as a result, the basic courses must prepare the student for specialization in either power or communication.

Dean Pender and Professor Warren attempt to solve this problem by presenting the theory of electric circuits and fields in a way which will be basic for any type of contemporary problem. The content and approach of this book are the outgrowth of a two-term course taught over a period of years at the Moore School of Electrical Engineering of the University of Pennsylvania. The purpose is to cover the whole field in a rigorous but limited manner so that subsequent advanced courses are well correlated. In order to accomplish this purpose some material is omitted, *viz.*, the actual operation of solving a differential equation, and only the results presented. However, all the conditions and limitations are carefully stated, and the material can be supplemented by reading the references in the bibliography at the end of each chapter. Particular care has been used to be consistent, and the rationalized M.K.S. system of units has been used throughout.

Two points of view are presented—the first, covering circuits in which current is confined to discrete circuit elements, and second, three-dimensional cases where the fields must be specified throughout a considerable region in space. Part I (229 pages) considers circuits of lumped constants through direct current nets, simple network theorems, transients, alternating currents, complex numbers, polyphase circuits and symmetrical component, filters and transmission lines and non-linear circuits. Part II (200 pages) covers electric fields and capacitance, magnetic flux and effects, electron ballistics and electron apparatus and electromagnetic radiation. Five appendices cover briefly the solution of linear differential equations with constant coefficients, three-dimensional vector analysis, electric fields for cylinders and vector potentials for magnetic phenomena.

There are many features to recommend this book, but its greatest value lies in its coordinated and balanced coverage of a large and complex field. The references and representative problems make it possible to supplement the text to satisfy the needs of any individual with a background of calculus and general physics.

A. E. VIVELL

SWARTHMORE COLLEGE

PHOTOMICROGRAPHY

Photomicrography—Theory and Practice. By CHAS. P. SHILLABER. $5\frac{1}{2} \times 8\frac{1}{2}$. 773 pp. 34 tables. 291 figures. Bound in blue buckram. New York: John Wiley and Sons. 1944. $10.00.

To a certain extent, the ability of a microscopist may be judged by the quality of his photomicrographs. While it is true that interpretation in terms of the solution to a more general problem is equally important, a photomicrograph certainly indicates the ability of the microscopist to operate the microscope correctly. The quality and optical characteristics of the lenses, the type of illumination employed, the preparation of the specimen, the magnification, the photographic variables of film type, exposure, etc., and many other equally important factors must all be intelligently selected if the photomicrograph is to illustrate credibly the relevant features of the specimen.

It is not surprising that a book which covers this subject contains over 700 pages. "Photomicrography" is more than a "cook-book" for taking pictures through a microscope. Even the microscopist who takes no pictures will still benefit from this book, since most of the information contained therein not only can, but should be used in visual microscopy.

The book is written with a minimum of technical terms. Those which must be used are explained in the first chapter. In addition, a glossary of microscopical and optical terms is included. At the close of seven of the eight chapters, there are questions and laboratory experiments which should prove useful to both the teacher and beginner.

The three chapters on the optics of the microscope are rather long and this may discourage the casual microscopist. However, the frequent and illustrative diagrams will be found helpful in grasping these fundamentals. Some 16 pages are devoted to listing the optical constants of objectives made by various manufacturers. Information of this sort can usually be obtained from catalogues and to this reviewer such tables unduly increase the size of the book.

The chapter on light filters and glare is important and well presented. The author's description of the troublesome effects and sources of glare is especially commendable.

Descriptions of photomicrographic cameras and photosensitive materials are combined in one chapter. Pictures of commercially available cameras, including those for special purposes, such as the Jelly spectrographic camera, are included. The brief discussion

of photography describes such factors as the speed, gamma, graininess and color sensitivity of the photographic plate, and typical formulas for developers, short-stops and fixing baths.

The chapter on specimen preparation deals mainly with those mounting media which are used when the image is obtained by transmitted illumination. A few typical formulas for staining solutions are presented. At the end of this chapter, a table of 14 pages describes various etching reagents for most of the common metals.

In the final chapter many typical problems of photomicrography and their solution are presented. This chapter contains over half of the 140 photomicrographs in the book. The use of several photomicrographs of the same field to show the effect of different variables is highly commendable. The pertinent information on the equipment, illumination, film, etc., used to obtain the picture, as well as a schematic diagram showing the position of the light sources, is given for most of the photomicrographs.

As the author himself indicates in his prefatory remarks, the book suffers by the omission of such subjects as polarized light, color photomicrography, ultraviolet, infrared and fluorescence microscopy and stereoscopic photomicrography. This will make the book less useful to the experienced microscopist. The author explains the omission as an attempt to avoid undue increase in the size of the book and indicates plans to add information on such subjects at a later date. It is the opinion of this reviewer, however, that portions of the present book might well have been omitted or shortened to make room for such discussion.

In summary, the book is highly recommended for beginners and teachers in the field of microscopy. The experienced worker will want to add it to his library if for no other reason than that it contains in one place a variety of information to which he will constantly refer. A new volume or a revised edition containing information on the less common phases of microscopy and written by such an able writer will be eagerly awaited by all in the field.

W. G. KINSINGER

HERCULES POWDER COMPANY

REPORTS

RESEARCH BOARD FOR NATIONAL SECURITY

THE recently announced Research Board for National Security is the result of recommendations made by a special committee on post-war research appointed by the Secretary of War and the Secretary of the Navy under the chairmanship of Mr. C. E. Wilson and composed of high-ranking representatives of the Army and Navy together with Dr. F. B. Jewett, Dr. H. C. Hunsaker, Dr. Merrill A. Tuve and Dr. Karl T. Compton. This committee recommended the establishment of a joint Army, Navy, civilian board directed to organize and administer a forward-looking program of research in scientific matters pertinent to national security.

It was recommended that this board be composed of ten Army officers of general rank and ten Naval officers of flag rank, and twenty civilians chosen from the fields of science, engineering and industry. This large board is expected to determine general policies and to insure appropriate attention to the wide field of interests of the Armed Services and other possibilities in all pertinent scientific fields. Within the large board there is an executive committee of three civilians plus an Army officer and a Naval officer, each of whom has responsibilities for coordination of research in the respective services.

This board will be concerned with the advancement of science and the development of techniques in those directions which may have profound influence on the conduct of future warfare. It is specifically not intended that this board should participate in the improvement of existing weapons or in other developments which are the function of the various research and development laboratories operating under the War and Navy Departments. It is expected, of course, that there will be ranges of overlap in the period in which a new idea passes out of the research stage through the development stage and into production, and in such cases there will be cooperation in which the Research Board for National Security tapers off its connection with the project as the appropriate branch of the Armed Services takes it on for the final development of a military weapon.

In accordance with the recommendation of the Wilson Committee the Research Board for National Security has been appointed by the president of the National Academy of Sciences at the request of the Secretary of War and the Secretary of the Navy, and the military members of the board have been nominated by these secretaries. The Wilson Committee also recommended attention by Congress to the ultimate establishment of the Research Board for National Security as an independent agency of government, and this question has been before the Select Committee of the House on Post-War Military Policy headed by Judge Woodrum. Pending the decisions regarding permanent organization, the Research Board for National Security will continue as a special agency of the National Academy of Sciences but will operate in such manner that it can be transferred with a mini-