Archimedes, opposite page 272. In none of these cases is it stated that these portraits are fanciful. It is true that historical material, including portraits of mathematicians, is usually of secondary importance in a mathematical text-book and may be omitted entirely, but when it does appear therein it should be reliable in order to inspire the student with due confidence and cultivate high ideals as regards truth.

Fanciful portraits of the same mathematician may naturally differ very widely, and this wide difference sometimes discloses nothing in regard to the known characteristics of the individual concerned. According to the *Bulletin of the American Mathematical Society,* Volume 40, page 189 (1934), under the heading "International Mathematical Congress Medals," an international committee was appointed to decide on awards to be made at the Oslo Congress (1936). The task of designing a suitable medal was entrusted to a Canadian sculptor who completed a medal showing a fanciful head of Archimedes, one of the greatest mathematicians of antiquity.

Since it was then well known that no reliable portrait of Archimedes was extant recourse was had to a collection of over thirty fictitious portraits then owned by D. E. Smith (1860–1944) and placed by him in the library of Columbia University. These show the views of many different artists and differ widely from each other. This procedure may be of interest to some who do not believe that the results obtained thereby have much scientific value. It is also of interest because it was used by such a large body of mathematicians, including some of the most noted at that time, and hence may appear to exhibit a widespread indifference as regards mathematical history.

The appearance of a considerable number of fanciful portraits in our elementary mathematical text-books is an element of the American history of mathematics which seems to have as yet received little attention. In fact, the history of the development of mathematics in our country has as yet received little attention. Important beginnings along this line were made by F. Cajori's work entitled "The Teaching and History of Mathematics in the United States" (1890) and by the small volume due to D. E. Smith and Jekuthiel Ginsburg, entitled "A History of Mathematics in America Before 1900." The former was published by the U. S. Bureau of Education and the latter by the Mathematical Association of America in 1934.

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SCIENTIFIC BOOKS

RADIO'S MEN OF SCIENCE

Radio's 100 Men of Science. By ORRIN E. DUNLAP, JR. New York: Harper and Brothers. 1944. $3.50.

To paint word portraits of the hundred men who have contributed most to radio is indeed no small task, but the author has succeeded in producing a profoundly interesting story and, within the limits dictated by space, he has given as full an account of the achievements and personalities concerned as could reasonably be expected. The result is a book which is full of interest from beginning to end.

Naturally, when one spreads the development of radio over a hundred individuals, there is likely to be ample room for divergence of opinion as to the appropriate choices which have been made. This is more particularly the case since many of the individuals named have paid their contribution, not to radio directly, but rather to some piece of apparatus or device which ultimately found its use in that field, but which was not invented with wireless primarily in mind. In those fields which pertain more particularly to radio itself, one might question the omission of certain names having to do primarily with measurements of the Kennelly-Heavisidean Layer and of the complex nature of the layer.

It would be out of place to make too much of minor points of technical criticism, but the elementary student of physics is so frequently castigated for failing to realize that Ohm's Law implies merely a proportionality between voltage and current, that one is rather concerned to find the sin for which he is so castigated supported in the citation of Ohm's Law given on page 34, to the effect that "A current flowing in any closed circuit is proportional to the force or voltage and inversely proportional to the resistance of the wire."

The author is to be congratulated upon having accomplished a very worth-while task and on having produced a book which is not only informative, but one which should serve as an inspiration to many young people whose ambitions urge them to simulate the outstanding inventors of the science of radio.

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ELECTRICAL COMMUNICATION

Electric Circuits and Fields. By HAROLD PENDER and S. REID WARREN, JR. 509 pp. Illustrated. 8½ by 5¼ inches. New York: McGraw-Hill Book Company. First edition. 1943. Cloth, $4.00.

THE rapid development of electrical communication

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.

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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