chanics of the calculus. The history throughout the book consists of standard material, much of it of questionable value for laymen. Despite the title, biography is a very small part of the book. Mr. Hooper's style is on the whole simple and readable.

William L. Schaaf's book contains seventeen essays, most of them written by mathematicians and dealing with five subjects: mathematics as an art, the origins of mathematical ideas, the nature of mathematical truth, the relationship of mathematics to science, and the humanistic bearings of mathematics. The essays are very uneven in several respects. Some of the authors are competent to speak for mathematics; others can do no better than quote from people whose knowledge of mathematics and history is to say the least suspect. The literary worth of the essays also runs a wide gamut; the best, in the opinion of the reviewer, are those by J. W. N. Sullivan, G. H. Hardy, and George Sarton. Quite a few of the essays discuss mathematics in such general terms or proffer such advanced concepts by way of illustration that one must question their value to laymen. The various authors repeat each other a good deal. On the whole the collection has rather little to say and reflects either too limited a search or a deficiency of able essayists on mathematics.

Morris Kline
New York University

Books Received

FUNDAMENTALS OF PHYSICAL SCIENCE. Second edition. By Konrad Bates Krauskopf. 676 pp. McGraw-Hill Book Company, Inc., New York City, 1948. $4.50.

THE ESSENTIALS OF ORGANIC CHEMISTRY. By C. W. Porter and T. D. Stewart. 394 pp. Ginn and Company, Boston, 1948. $4.00.

PRINCIPLES OF MATHEMATICAL PHYSICS. Second edition. By William V. Houston. 363 pp. McGraw-Hill Book Company, Inc., New York City, 1948. $4.50.

NUCLEAR RADIATION PHYSICS. By R. E. Lapp and H. L. Andrews. 487 pp. Prentice-Hall, Inc., New York City, 1948. $4.50.

MECHANICS. Second edition. By John W. Breneman. 144 pp. McGraw-Hill Book Company, Inc., New York City, 1948. $2.50.

THEORY OF EXPERIMENTAL INFERENCE. By C. West Churchman. 292 pp. The Macmillan Company, New York City, 1948. $4.25.

THE COLLECTED WORKS OF J. WILLARD GIBBS. Two volumes. Reprint. 925 pp. Yale University Press, New Haven, Connecticut, 1948. $8.00.

THE MATHEMATICAL BASIS OF THE ARTS. By Joseph Schillinger. 696 pp. Philosophical Library, New York City, 1948. $12.00.

RADIO AT ULTRA-HIGH FREQUENCIES. Volume II (1940–47). Edited by Alfred N. Goldsmith, Arthur F. Van Dyck, Robert S. Burnap, Edward T. Dickey, and George M. K. Baker. 485 pp. RCA Review, Princeton, New Jersey, 1948. $2.50.

NEWS and VIEWS

Xerography

A new dry method of photography and printing by electrostatics was demonstrated by R. M. Schaffert and Joseph C. Wilson at the annual meeting of the Optical Society of America in Detroit. The process, called xerography, substitutes powders for ordinary developers and ink, and involves no chemical reaction. It was invented by Chester F. Carlson and developed by Battelle Memorial Institute, and the Haloid Company has arranged to use and license it.

In the photographic operation, a sheet of aluminum, or some other electrical conductor, is coated with a photoconductive insulating material and passed under a corona spray which creates an electrostatic surface charge and makes the plate sensitive to light. When this plate is exposed in a camera—or in a contact printing frame—it can be made to reproduce an image because the charge leaks from the photoconductive layer into the aluminum backing wherever light strikes it. Developer powder (a mixture of a coarse carrier material and a very fine resinous material, electrically charged through friction) is then passed over the plate and its oppositely charged particles stick to the image pattern. The plate, which is a negative, can then be printed by putting a piece of paper (or some other material) over it and charging the paper with the corona spray so that it attracts the powder image away from the plate. The resulting print is fixed by heating, which fuses the powder to the paper.

A laboratory model printing machine used in the demonstration printed by xerography at a rate that compares favorably with that of the best newspaper presses. The printing plate may be prepared by the technique just described, by ordinary photomechanical means, or possibly by typing through carbon paper coated with the electrically insulating material. This plate is fastened to a cylinder, which as it turns carries the plate successively through a corona spray, a developing chamber, and under paper (fed into the machine by standard means). Then paper and plate are both charged and the printed paper is sent through a heating unit or a fixative spray.

Mr. Wilson, president of the Haloid Company, emphasized the fact that the process is still incomplete. As its first application, Haloid hopes to bring out a duplicating machine for office use within the next few months. Future plans include a camera that will produce a finished print within a few seconds, and many applications in the graphic arts industry.

Gaseous Electronics

Probably no phenomenon studied by physicists has contributed more to knowledge about the nature of atoms and molecules than electrical discharge in gases. Yet how many readers have a clear conception of the mechanisms in, say, the corona, glow, or arc discharge? In spite of all that has been learned about individual processes, when many are simultaneously active, as in a discharge, the