Book Reviews

Microscopium. Communication No. 95. Maria Rooseboom. National Museum for the History of Science, Leiden, 1956. 59 pp. Illus.

The curator, Maria Rooseboom, tells the story of the microscope and the essential discoveries made with it from the early 17th century, partly with words, mainly with superb illustrations. The spirit and style of her book are set with a quotation from the Court Physician Borel, who wrote the first independent publication on microscopy (1656—9 years before the *Micrographia*). A synoptic chart relates by century her choice of the leading events in economy, politics, philosophy and art, physics and chemistry, biology and medicine, and microscopy. The development of the compound microscope is described with respect to its optical parts, illumination, arrangements for focusing, movement of the specimen, stand and foot, and the binocular body. The simple microscopes are considered. Discoveries "with the aid of the optical microscope of importance for medical science" are tabulated from 1660 to 1924, and a section on the microscope and medical science sketches the advances made as men could see cells and tissues better and better. Rooseboom has read this early literature and uses apt quotations to reconstruct actual history.

Many of the 115 illustrations are sketches in which the details of microscope improvements show in minimum space, yet very little of the basic advancement is omitted. Large (10-in.) colored pictures include the Marshall, Culpeper, Martin Drum, Tripod, Martin Grand, and Amici Horizontal microscopes. Other microscopes, parts of them, drawings and photomicrographs are shown in halftone. Some pictures reveal what could be accomplished with the inferior images before achromatism. Selected typical 19th-century microscopes are contrasted in silhouette on a page. The bibliography includes 17 references.

The book reads easily and, despite its compactness, leaves the reader with a clear picture of the changes and improvements in the microscope and in the knowledge gained from its use. Some readers will learn that mechanical stages, low fine adjustments, and other present-day conveniences are only improvements on centuries-old inventions. Very little essential material is left out, although other historians would make other choices, and Rooseboom's interpretations are reasonable. She starts with a written reference of 1621 and makes no attempt to name the first inventor of the compound microscope or to comment on the preferences of others for this honor.

The binocular biobjective and polarizing microscopes are barely mentioned. Zernike's phase-contrast receives two pages, while fluorescence, ultramicroscopy, and other methods are omitted or mentioned only in passing. Achromatism, " . . . salvation . . . just around the corner . . ." is a well-told story in which the name of Tolles is conspicuously absent. I am sorry that no effort was made to show the actual sizes of the microscopes, especially in the colored plates, which show the beauty but not the noble size of early microscopes.

Seminar programmers on the history of science will rejoice in this ready-made, beautifully illustrated answer for the history of the microscope, and we may hope that Olivier of the Netherlands, Pfizer, Inc., will stimulate and sponsor volumes on other instruments in the Leiden Museum for the History of Science, for I am sure the curator would enjoy writing the guide books for us.

OSCAR W. RICHARDS
American Optical Company

Flow of Gases through Porous Media. P. C. Carman. Academic Press, New York; Butterworths, London, 1956. 182 pp. Illus. $6.

This volume serves as a backdrop to P. C. Carman's contributions to surface area and surface flow studies. It is a valuable book with well-selected topics. It is a much needed book, considering that to date no comprehensive treatment of flow through porous media exists. It is a well-written book, with an appealing format, and is not too long. It is recommended.

I have had occasion to compile nearly all available references on the subject of flow through porous packings or beds. Until Carman's initial contribution (1938) calling attention to the Austrian Kozeny's fundamental equation of flow through porous media (1927)—it would be interesting to know how Carman happened on this reference—the important papers on the subject probably numbered less than 20. Since 1938, there have been added no less than 500 separate pieces, and all these begin with the Kozeny-Carman equation. There is no end in sight, though definitely there has arrived the point of diminishing return. More than 95 percent of all contributions have concerned themselves with the so-called "Kozeny-Carman" constant; it is at present doubtful that such a constant in the true sense of the word exists. Actually it is really no more a "Kozeny-Carman" constant that it is a "Darcy" constant, and this most contributors to the subject fail to appreciate. But none of this detracts from the text. It is an author's privilege to conform with current usage and acceptance of terms.

Outstanding is the chapter on flow of sorbable gases. Carman has made a number of important contributions to this subject. The treatment given in the text is simple and direct. He has put together the subject matter with care and the topic is well integrated.

There are some sins of commission and omission as always there must be in a "first" book on a subject. There is, for example, too little said about the subject of permeability—the many discussions regarding its true units. The unit of the "Darcy" is attributed to Muskat (1937), but credit belongs to Fancher, Lewis, and Barnes (1933). The author gives recognition to Schiller (1923) for application of the hydraulic radius concept in deriving the so-called "Kozeny-Carman" equation; this reference antedates that of Kozeny, and it would appear that the "Kozeny-Carman" equation should be called the "Schiller-Carman" equation. But this is actually not the case. It is hard to believe that the author could have overlooked the hydraulic radius approach, which should actually be credited to Fair and Hatch (1933). These investigators derived the Kozeny equation independently of Kozeny. Yet there is no mention of this, although Carman uses precisely the approach Fair and Hatch developed. No discussion of just what Kozeny did is given in the text.

Carman's initial contribution was to apply the Kozeny equation to the measurement of the specific surface area of particles. Although I (1937) was doing the same thing at the same time and quite independently, using Blake's (1922) porosity function, my work is not mentioned but Blake is cited. These mat-