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-

ters are omissions to the proper historical development of the subject, although they do not militate against the usefulness of the text and do not distort the over-all perspective and design of the subject matter treated.

J. M. DALLAVALLE
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Air Pollution Handbook. Paul L. Magill, Francis R. Holden, and Charles Ackley, Eds. McGraw-Hill, New York, 1956. 720 pp. Illus. $15.

The growing problem of air pollution in urban environments has resulted in increased demand for information from scientists, air-pollution control officials, engineers, manufacturers, and, in some instances, the lay public. The introduction of a handbook on this subject therefore is very timely, and the present volume fills this need in a comprehensive manner.

This handbook is divided into 14 sections covering major items, such as the importance of city planning and plant location and the physical and chemical aspects of the problem. There are also three chapters covering biological aspects —namely, the epidemiology of air pollution, the effects of air pollutants on farm animals, and the effects of air pollutants on plants. From the evaluation standpoint, sections are provided on sampling procedures and analytic methods and experimental test methods; from the control standpoint, chapters are provided on equipment and processes, legislation, and meteorological aspects.

The book is well organized in spite of the fact that it has a large number of contributors. The contributors are well qualified in their phase of the problem. The material is covered in a direct manner as in technical handbooks, but each chapter is extremely well documented with references. Because of the new information rapidly being developed in this field, it is difficult for any such comprehensive handbook to be completely up to date upon release. Fundamentals and background for each problem are well covered in this book. Information on all types of pollution sources is included and discussed in detail. Of particular interest, from a fundamental standpoint, are the chapters on the physics of the atmosphere and the evaluation of weather effects.

Epidemiology of air pollution which is discussed by Phair is perhaps the only major area in which extended quantitative information is lacking. The chapter indicates this lack to be a serious problem. Essentially, the material presented in this section is a statement of the problem. Quantitative information is limited to localized incidents, such as those at Donora and in London.

The sections on analytic methods, sampling procedures, and the experimental test methods provide enough information for new workers entering the field or those desiring further knowledge in far more detail than the customary handbook. In these areas the book approaches a textbook and should, therefore, be very useful for teaching advanced students in the field of community air pollution.

The section on abatement of air pollution is perhaps more descriptive than applied in terms of design of air and gas cleaning equipment. It provides fundamental knowledge and references, however, which enables those interested to pursue the subject in greater detail. Considerable discussion of combustion problems, as related to incinerator design and operation, is included which will be very useful.

This recent book is highly recommended for those interested in the air-pollution field in general and as a working handbook.

LESLIE SILVERMAN
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Determination of Organic Compounds. K. G. Stone. McGraw-Hill, New York, 1956. 233 pp. Illus. $5.

This book appears to have been designed as a textbook for courses in quantitative analysis of organic compounds. With the growing importance of organic chemical technology, some departments of chemistry have felt that training in such methods should be offered to their students. For such courses K. G. Stone's book should be popular. It is carefully and logically organized and contains much discussion of both the theoretical and practical aspects of organic quantitative analysis.

I was struck by both the breadth of the theoretical discussions and the many references to contemporary literature. Thus, the author, in discussing the use of lithium aluminum hydride in the quantitative determination of active hydrogen in organic compounds, includes a table with references describing the action of the reagent on a large number of organic functional groups as well as that of immediate interest; and, under the methods for the determination of weak acids by titration in nonaqueous media, he seizes the opportunity to introduce the reader to general acid-base theory and the "leveling effect." From these two examples chosen at random, it should be apparent that the text represents far more than a mere catalog of analytic methods with a discussion of sources of error.

Only two procedures of importance were omitted: the use of ultraviolet and infrared absorption spectroscopy in organic quantitative analysis, and the Kuhn-Roth determination of carbon-linked methyl groups, which is very useful in work with natural products.

RICHARD H. EASTMAN
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Computers. Their operation and applications. Edmund C. Berkeley and Lawrence Wainwright. Reinhold, New York; Chapman & Hall, London, 1956. 366 pp. Illus. $8.

This book is offered as a successor to Berkeley's 1949 book *Giant Brains or Machines That Think*. It is a general description of analog and digital computers and their elementary principles. The section on applications is very general, and almost all of ten pages of comments by prospective users are 5 to 7 years old. Little information is given on the experience of the many companies who have bought or rented computers. The section describing Berkeley's miniature computer, Simon, is longer than that describing recent large-scale computers. No information is given on any of the numerous medium-sized computers now available. Apparently the book's "Checklist of characteristics," pages 65–71, has been reprinted without acknowledgement from the *Electronic Digital Computer Survey* by the Vitro Corporation of America.

WILLIAM W. YOUDEN
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The Image. Kenneth E. Boulding. University of Michigan Press, Ann Arbor, 1956. 175 pp. $3.75.

This monograph is the by-product of a year spent by the author, an economist, at the Center for Advanced Study in the Behavioral Sciences, Stanford, California. It is an exercise in abstraction, an attempt to indicate the relatedness to varied fields of study of a single conception; and it bears both the virtues and defects of being a memorandum, as Kenneth Boulding himself describes it, dictated without interruption in "a certain atmosphere of intellectual exaltation . . . which no sober editing can quite remove." It proposes, with modesty but certainly no less than half-seriousness, the creation of a new science.

Boulding's central idea is that of "the image," and its study he names *eiconics*. While he draws generously on the biological, as well as behavioral, sciences, his own intellectual habitat would seem to fall most naturally within the soci-