in quality and relevance to the real world.

Many fields are represented by the papers in this volume. N. Arley discusses, perhaps too briefly, the results of his long collaboration with experimentalists in the field of carcinogenesis. J. Neyman and E. L. Scott describe a model for epidemics which takes into account spatial migration. Stochastic processes in genetics are discussed in papers by S. Wright, S. Karlin and J. McGregor, and by W. J. Schull and B. R. Levin. These papers range from a historical account by Wright and an account of the transition between discrete and continuous genetic models by Karlin and McGregor to a description of a simulation program by Schull and Levin. Other participants discuss statistical models for the evaluation of biological data, the application of game theory to certain psychological experiments, a possible mechanism for biological clock mechanisms, a historical account of early stochastic models in epidemic theory, an attempt at an abstract classification of catalytic processes, and a statistical study of arteriosclerosis.

It is probably too early to offer an evaluation of the place of stochastic methods for biological problems. Their role in genetics is certainly well established. However, it is usually orders of magnitude simpler to develop a mathematical model than to perform the experiments necessary to verify it. The work reported in this book should not be judged as pure mathematics, but rather as an attempted elucidation of natural phenomena. As such, much of the work seems very far from the goal.

GEORGE H. WEISS
National Cancer Institute, National Institutes of Health

Analytical Techniques

Microwave Scanning Antennas. vol. 1, *Apertures*. R. C. Hansen, Ed. Academic Press, New York, 1964. xviii + 442 pp. Illus. $16.

The editor, Robert C. Hansen, has assembled outstanding contributors for his two-volume treatise **Microwave Scanning Antennas**. Volume 1, *Apertures*, the subject of this review, covers aperture theory (R. C. Hansen), reflecting systems (L. K. De Size and J. F. Ramsay), optical scanners (R. C. Johnson), radio telescope antennas (Hsien Ching Ko), and large radomes (J. A. Vitale).

A welcome feature of this new addition to the antenna literature is its devotion to the intensely practical without sacrifice of mathematical rigor. The extensive mathematical developments, however, belong to the engineer who desires to understand as well as to solve his antenna problems rather than to the scientist who is preoccupied with the theory of radiating systems. This emphasis on analytical techniques makes the volume a powerful tool for those working on new problems as well as for those interested in understanding the solution of past problems.

In developing their several subjects, the authors demonstrate that in recent years the antenna art has indeed become much more of a science—or perhaps that antenna science has been given more engineering effectiveness through analytical sophistication. In the chapter on optical scanners, for example, more than half of the references are to work done during the last 8 years. In many cases, however, the basic concepts date back to the inventive war years or earlier, sometimes predating the earliest reference in the text by 10 to 15 years or more.

Volume 1 represents the best and most complete treatment that I have seen on its subject. Thus, chapter 1 follows a general treatment of aperture theory with detailed treatments of aperture distributions and of pattern synthesis and supergain. Chapter 2 treats reflectors, feeds, and reflector-feed systems for a variety of purposes, beginning with Hertz and ending with space applications. Chapter 3 describes the many ingenious inventions that have resulted from the application of optical principles to achieve the scanning of directive beams, an uphill fight owing to the limited number of wavelengths in any reasonable microwave aperture. Chapter 4 deals with the functions of a radio telescope and the nature of its received signal, as well as with the means of achieving high-resolution steerable apertures, a variety of interferometer techniques, and possible designs of the future. Chapter 5 concerns itself with large radomes, their functions, a great variety of types, the effects on the characteristics of the enclosed antenna, environmental problems, and structural and electrical design. Volume 1 not only provides an adequate development of its subject, but prepares the way for volume 2, *Arrays*, which will treat aspects of the subject in which recent advances promise spectacular future accomplishments.

LESTER C. VAN ATTA
Lockheed Missiles and Space Company

Mathematics

The New Mathematics Dictionary and Handbook. Robert W. Marks. Bantam Books, New York, 1964. 186 pp. 95¢.

Inexpensive reference books in mathematics are certainly needed, but *The New Mathematics Dictionary and Handbook* almost completely disappoints the hopes raised by statements made on its cover and in its preface. The reader is promised answers to "every kind of question about mathematics . . . . explanations for all the puzzling terms . . . . practical working information . . . . the most advanced areas of the new mathematics . . . . biographies of the most important mathematicians from Euclid to Einstein. . . ." Instead he gets a hodgepodge of information and misinformation, obsolete terms (for example, *aliquot part*), incorrect definitions (for example, see the definition of asymptote), uneven coverage of both classical and "modern" terminology, and no coverage of nonelementary mathematics. Sciolism shades into quackery in the area of contemporary biography. Only one living mathematician is mentioned (Gödel), but three pages are devoted to the biography and alleged mathematical discoveries of the engineer R. Buckminster Fuller who has added nothing to mathematical knowledge and belongs in a list of what De Morgan called "paradoxers" rather than in one of mathematicians.

Since the author of this book is not one of them, mathematicians need feel responsible only for leaving such a gap in the literature. But this book will add nothing to the reputations of the publisher or of the two science editors whose endorsements were presumably written without sufficient examination.

KENNETH O. MAY
Department of Mathematics, Carleton College and University of California