anced collection of photographs and drawings to illustrate this book, including some from the work of farmer-photographer Wilson Bentley of Vermont, whose photomicrographs of snow and frost were collected over a period of 40 years before Nakaya. Through his acknowledgments and a good index, it is apparent that he has drawn upon a wide knowledge and familiarity with snow-lore and snow-science. He makes room for the Abominable Snowman and Alfred Wegener, Homer and Chaucer, Olaus Magnus and Vincent Schaefer, Byrd and Hobbs, "Snowshoe" Thompson and Langmuir.

This is by no means a textbook or even a technical book, though it treats of a subject that has a technical side. From the very first chapter one knows that the author loves winter and the snow, and before bumping up against the glossary, the average reader will also have an appreciation of what scientists have accomplished in finding out how, when, where, and why it snows, and of the men (other than Bell) who have left "footprints in the snows of time" for those who would follow. *The Wonder of Snow* belongs on every high-school science reference shelf and will make a splendid gift for youngsters and oldsters alike who have a fondness for nature and out-of-doors—and snowflakes.

HERBERT B. NICHOLS
U.S. Geological Survey, Washington, D.C.

H. A. Lorentz, Impressions of His Life and Work. G. L. de Haas-Lorentz, Ed. North-Holland, Amsterdam, 1957. 172 pp. + plates. $3.

The purpose of this volume is to give an impression of one of the greatest physicists of the first quarter of our century.

Most of the book is taken up by the very personal reminiscences of Lorentz's eldest daughter, herself a physicist and the wife of a physicist. Interspersed between these reminiscences are contributions by friends and pupils. Fokker gives a semipopular account of Lorentz's *oeuvre,* Van der Pol assesses the importance of Lorentz's work in the field of modern telecommunication, Thysse tells the fascinating story of how Lorentz calculated the influence of the proposed reclamation of most of the Zuyder Zee on the behavior of the tides in the remainder, and Casimir discusses the influence of Lorentz's ideas on modern physics.

One is left with a very definite picture of the man and physicist Lorentz, not least through the short contributions by Einstein (especially written for this volume) and Ehrenfest (a translation of his speech at Lorentz's funeral). Anybody interested in the history of science and in scientists as human beings will read this volume with great profit.

D. TER HAAR
Clarendon Laboratory, Oxford

Electricity and Magnetism. B. I. Bleaney and B. Bleaney. Clarendon Press, Oxford, England, 1957 (order from Oxford University Press, New York). xiv + 676 pp. Illus. $10.10.

Here is just the book for a scientist who cultivates another field to have on his shelf for easy reference. The authors, B. I. and B. Bleaney, both lecturers in physics, at different colleges of Oxford University, hope to fill "the need for an up-to-date text on *Electricity and Magnetism* which would cover the whole field, both the theory and the practice," for their undergraduate students, and a few "chapters have been included which may form part of a graduate course."

They use the word *comprehensive,* which is surely no overstatement, for after eight chapters on "fundamentals at an elementary level," they romp through chapters on alternating-current theory; electromagnetic waves (including filters, transmission lines, and waveguides); electromagnetic machinery; thermionic vacuum tubes (three chapters, and it must be these they had in mind when they spoke of "practice"); and alternating-current measurements. After these come the chapters that I suppose are suitable for a graduate course: theory of the dielectric constant; theory of conduction in the solid state; the atomic theories of paramagnetism, ferromagnetism, and antiferromagnetism; and magnetic resonance. There is a final chapter on units, and I am happy to see that the authors use the rationalized metre-kilogram-second system throughout the book.

It is hardly necessary to remark that a book with this coverage, even a book of nearly 700 pages, can never be profound. But it is surprising how thorough the book can be and still remain readable and easy to follow. This argues careful planning and elimination of nonessentials. I find that when I read in unfamiliar fields, the book is interesting and informative; when I read in fields that I know well, it is clear and accurate.

Definitely this is a book to be taken down off the shelf when some information is wanted on, say, contact potentials or nuclear magnetic resonance. You will find a brief and illuminating section on either. This may be enough, but it may very well be that you will then want to read further in more detailed treatises. This is where Bleaney and Bleaney fail us, for they have missed the opportunity to give lists of references for the inquiring reader. Perhaps in some future edition . . .

You should not approach this book without a previous knowledge of general physics, such as most American colleges give to freshmen. In mathematics, the language of calculus is supposed to be familiar. Vector analysis is used, with a notation nearly enough like the common style to keep one from feeling much annoyance on this score; the appendix is adequate for purposes of review rather than of learning.

The exposition is clear and straightforward. The style is simple, but it has an elegance that we have come to expect of the English universities. *Electricity and Magnetism* is pleasant reading and, in brief, is a book I shall be glad to have for my own frequent use.

H. H. SKILLING
Stanford University

Modern Mathematics for the Engineer. Edwin F. Beckenbach, Ed. McGraw-Hill, New York, 1956. xx + 514 pp. Illus. $7.50.

The Department of Engineering at the University of California has organized a series of lecture courses in modern physics, mathematics, and chemistry. The objective was to acquaint engineers with some late scientific discoveries and to stimulate their application in engineering.

The first set of these lectures—those on physics—was published a few years ago and contained an authoritative, broad, and largely nontechnical presentation of a large part of modern physics, with very little use of the mathematical formalism. The present volume, covering the lecture course on mathematics, has a quite different character. It covers topics which can be treated by differential and integral equations, probability and game theory, and computational methods—topics which form a smaller, though fundamental, part of modern mathematics.

The book contains an "Introduction" (Weller) and is divided into three parts. The first part is called "Mathematical Models." There are chapters on oscillations (Lefschetz), stability theory (Bellman), calculus of variations (Hestenes), and hyperbolic (Courant) and elliptic (Schiffer) partial differential equations. Two chapters are on applications: exterior ballistics (Green) and elastostatics (Sokolnikoff). Obviously these applications were selected because the lecturers happened to be specialists in these topics.

Other, equally interesting, applications to electromagnetism, and so on are not treated.

The second part, entitled "Probabilistic Problems," contains chapters on prediction (Wiener), game theory (Bohnenblust), operations research (King), dynamic programming (Bellman), and Monte Carlo methods (Brown).

The third part, entitled "Computational Considerations," treats matrices, with applications to engineering problems (Pipes); functional transformations (Barnes); conformal mapping (Beckenbach); nonlinear (Morrey), relaxation (Forsythe), and steep descent methods (Tompkins); and, finally, high-speed computing devices (Lehmer).

Most of the authors are well-known masters of their subjects, and they give excellent presentations, which, though condensed, are intelligible and stimulating. It is not to be expected that the chapters will form a homogeneous unit. The requirements for intelligent reading vary from elementary advanced calculus to Lebesgue integration. The chapters can be read independently and contain references for further reading. One of the authors states, disarmingly, that he is a pure mathematician with very little contact with engineering problems. Most of the authors, however, have had extensive experience in applied mathematics and specific engineering applications. On the whole, the volume is warmly recommended to the modern engineer who has a good mathematical background.

EUGENE GUTH
Oak Ridge National Laboratory

Astronomical Optics and Related Subjects. Proceedings of a Symposium. Zdenek Kopal, Ed. North-Holland, Amsterdam; Interscience, New York, 1956. 428 pp. Illus. $12.50.

It is unfortunate that this excellent volume has a rather misleading title. To be sure, all the subjects treated apply to the problems of modern astronomy, but, more than that, most of them apply more broadly, to optics in general. As a matter of fact, many of the contributors to the volume would not designate themselves astronomers.

This is the proceedings of a four-day symposium held at the University of Manchester, England, in April 1955. The aim of the symposium was twofold: to provide a forum for the discussion of certain fields in optics of timely interest and astronomical significance and to strengthen further the liaison between astronomy and optics by bringing current astronomical desiderata to the attention of contemporary optical experts. The symposium was attended by 105 persons from five European countries; America was not represented. In all, 61 papers were presented, and 46 of them are published here, with an excellent 12-page introduction by the editor, Zdenek Kopal, who is professor of astronomy at Manchester, and with brief concluding remarks by J. Rösch of the Observatoire du Pic du Midi. Most of the text is in English, but ten of the papers are in French and two are in German; each of the 12 papers is preceded by a short abstract in English. There is an author index, but no subject index, alas. There are numerous line-drawing illustrations and several excellent plates; the typography is excellent.

The book is divided into seven main sections corresponding to the several sessions of the symposium. Each section contains from four to ten short papers. The subject matter of the first three sections is definitely in the "general physical optics" category: information theory and optics; optical images and diffraction; interferometry and coherence problems. The last four sections are devoted to topics of more special application to astronomy: electronic devices in astronomical optics (including both photoelectric photometry and the new and promising television techniques) that are supplanting photography in many applications; resolution problems and scintillation or "seeing" as the deleterious, irregular refraction by the earth's atmosphere is commonly called; wide-angle optical systems and aspheric surfaces, of such practical importance in modern astronomical telescopes; and filter photography, in which both dye filters and interference (thin film) filters are used. The interest in this last topic surely extends to fields other than astronomy.

An indication of the newness that has come into optics, changing it so radically from a formulism of classical physics, is given by D. Gabor of Imperial College, London, when he states that "optics was always considered as a good didactical preparation for wave mechanics; now it appears that quantum mechanics is not a bad preparation for optics" (page 30). Although it would appear that leadership in the "new optics" has come from Great Britain, France, Holland, Germany, and Italy, the contributions of the Americans Claude Shannon, Norbert Wiener, and Otto Schade are often mentioned by our colleagues overseas. In October 1951 a symposium on optical image evaluation was held at the National Bureau of Standards in Washington, attended by participants from many countries, and in June 1955 a symposium on the formation and evaluation of images was held at the University of Rochester. Several Americans attended the international conference in September 1954 in Florence, Italy, on "Problems in Contemporary Optics," which was, in a scientific sense, the forerunner of the Manchester symposium.

This volume is highly recommended to those who wish to become more familiar with the extent of modern optics and especially to astronomers and other optical folk who are interested in extracting the maximum amount of information to be obtained from the diffraction pattern that is called an optical image.

STANLEY S. BALLARD
Scripps Institution of Oceanography, University of California

Social Characteristics of Urban and Rural Communities, 1950. A volume in the *Census Monograph Series*. Otis D. Duncan and Albert J. Reiss, Jr. Wiley, New York; Chapman & Hall, London, 1956. 421 pp. $6.50.

The volume is an amplification and illumination of materials from the 1950 census dealing with the social characteristics of different-sized communities. The authors consider 11 classes of places, ranging from urbanized areas of three million or more inhabitants to sparsely settled farm regions. They set forth some interesting characteristics of these various bands in the sociological spectrum. Women outnumber men in cities and other incorporated places, but in the extremely rural regions the male animal predominates. The urban population in general is characterized by a higher median age, a lower fertility ratio, smaller families, higher percentages of separated and divorced persons, a larger percentage of women in the labor force, more years of education, higher incomes, and so on. These urban-rural differences might be easily surmised or discovered from other sociological writings, but their extent is here definitely stated and graphically illustrated. The authors have made an instructive and commendable contribution to social science.

BENJAMIN H. WILLIAMS
Industrial College of the Armed Forces

The Human Brain. From Primitive to Modern. A. M. Lassek. Thomas, Springfield, Ill., 1957. viii + 242 pp. $4.75.

The purpose of this book, the author says, "has been to try to portray the significance and impact of the long, past environment upon that dynamic organ, the human brain, and what it may mean to us in the middle of the 20th Century." The description of the brain itself and of the patterns of its working is brief