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Book Reviews

Paul R. Yoder, Jr., Book Reviews Editor

Send books for review to the Managing Editor, Optical Engineering, P.O. Box 10, Bellingham, WA 98227-0010. Since there is not space to review all books received, the Book Reviews Editor will use his discretion in selecting those of most interest to the readership of this journal.

Astronomical Optics

Daniel J. Schroeder, xii + 352 pp., illus., subject index, references, and bibliography. ISBN 0-12-629805-X. Academic Press, Inc., 1250 Sixth Ave., San Diego, CA 92101 (1987) $45 hardbound.

Reviewed by Robert R. Shannon, Optical Sciences Center, University of Arizona, Tucson, AZ 85721.

This book is a thorough and detailed text on the optical design of astronomical telescopes. The coverage includes all of the designs in general use, along with some of the less popular approaches. Basic aberration theory is followed by a discussion of the limitations of various important telescope configurations. Auxiliary telescope instruments, such as spectrometers, are also covered in some detail. Good tabular information is provided for the engineer interested in optical designs, but the book does not include a comprehensive treatment of the mechanical and environmental design problems that usually influence the final selection of an optical design.

The first five chapters of the book cover the required geometrical optics, aberration theory, and computational methods. These chapters are adequate but not particularly well organized.

The best and most important part of the book begins in Chap. 6 with the presentation of aberration considerations that are important in selecting a telescope configuration. The author starts with the simple paraboloid and continues in detail through the basic two-mirror Cassegrain and Gregorian telescopes. In each case, a typical form of telescope is discussed, and the aberration content is described. Tables of data permit the reader to vary the designs and examine the effect of configuration changes upon the aberrations.

The author continues in Chaps. 7 and 8 with a similar treatment of Schmidt systems and general catadioptric telescopes. The use of auxiliary optics, such as field flatteners and focal reducers, is covered in Chap. 9. The treatment is based upon formulas for third-order aberrations, with the image quality evaluated in terms of angular aberrations. Supporting information from ray tracing is included where appropriate.

The diffraction image in the presence of obscurations and small aberrations is discussed in Chap. 10. The treatment here is not comprehensive but is satisfactory for the task of evaluating telescope images. Chapter 11 uses the presumed aberrations and fabrication errors of the Hubble Space Telescope to develop some examples of what type of imagery can be expected from that instrument. The author apparently intends this chapter to serve as an application chapter but does not extend the analysis to the important cases of less perfect telescopes, especially for ground usage.

Chapters 11 through 15 discuss telescope instrumentation. Spectrometers are the primary interest here. Pertinent tables and formulas are given describing the aberrations of such instruments. In most cases the discussion is at a level that would appeal to a design engineer.

Chapter 16 reviews the techniques necessary to determine the signal-to-noise ratio to be expected in an operational telescope system. The treatment is somewhat empirical but is more than adequate for most required design analyses of telescopes and detectors.

Finally, Chap. 17 discusses some of the trends that are currently of interest in telescope design and engineering. This discussion is very general. The author does not provide enough detail to serve as a useful basis for understanding the design of such systems as array telescopes.

There are some topics that might have been included if the author had intended a comprehensive work. The compact configuration of telescopes with fast primaries leads to potential economy, but third-order theory as used in this book is not adequate for designing such systems. The problems of adequate baffling for stray light and the effect of surface scattering on images were also not covered. Also it is unfortunate that the author did not include some graphics indicating the effect of image errors upon star images.

In summary, this is a good text on the subjects it intends to cover. The author has put a great deal of useful information into the book and has discussed the options available in many of the traditional telescope designs. This book should be useful to anyone with an interest in the optical design of such instruments.

Books Received

Career Management for Engineers: Forty Essays on the Relationship Between You, Your Employer, and Your Profession, by Robert W. Herden, xv + 102 pp., contains annotated bibliography. ISBN 0-533-07742-7. Vantage Press, Inc., 516 West 34th Street, New York, NY 10001 (1988) $10.95 hardbound. Observes that critical decisions are required of new engineers who have typically received little or no formal training in building and managing a career in a competitive environment. Discusses goals, describes career initiatives, and warns of traps and hazards commonly encountered.

Photoelectric Sensors and Controls: Selection and Applications, by Scott M. Juds, Opcon, xiv + 390 pp., illus., subject index, references, three appendixes. Mechanical Engineering Series Vol. 63, L. L. Faulkner and S. B. Menkes, series editors. ISBN 0-8247-7886-3. Marcel Dekker, Inc., 270 Madison Ave., New York, NY 10016 (1988) $99.75 hardbound. Covers basic fundamentals of optics; gives an analysis of major sensor configurations; describes electrical control interfaces and control logic functions and specifications; and discusses application issues, specific examples, and environmental issues.