# DEPARTMENTS

## BOOK REVIEWS

### The Physics of Moiré Metrology

Oded Kafri and Ilana Glatt, 198 pages, illus., index, references, and one appendix. Wiley Series in Pure and Applied Optics, Joseph W. Goodman, Series Ed. ISBN 0-471-50967-1. Wiley Interscience, 605 Third Avenue, New York, NY 10158-0012 (1990) $39.95 hardbound.

**Reviewed by Kevin G. Harding,** Industrial Technology Institute, P.O. Box 1485, Ann Arbor, MI 48106.

The moiré effect has been known and used for a great many years. Ronchi testers, strain gauge calibration, and the newer fields of contouring and deflectometry are all examples of the range of this technology. Earlier publications tended to treat moiré as a side note to such fields as holographic interferometry. Other publications also have been limited largely to the field of strain measurement. *The Physics of Moiré Metrology* presents moiré methods as a parallel discipline in their own right. The mathematical parallel between moiré as an intensity interference and more conventional coherent interferometry is the basis of the theories described in this book.

The book begins with a brief theory chapter that compares moiré to classical interferometry, which is a good, if brief, primer on the concepts. The second chapter discusses techniques used primarily for fringe improvement and readout. Given the breadth of publications on phase shifting analysis of moiré, the one paragraph description seems overly terse for those specifically interested in computer analysis. This book focuses on the theory of moiré, and thus other books would be more appropriate for those interested in automated analysis of interferograms. Chapter 3 enhances the theory discussion with considerations of light coherence, optical resolution, and similar factors on the contrast of the moiré pattern. In Chap. 4 the comparison of moiré to holography is made first by presenting the basic theory of holography and then by contrasting the operation of holography with shadow moiré methods. A brief, though not necessarily complete, discussion of slope determination in moiré is presented. The comparison of moiré to holography is completed by a very brief discussion on vibration measurements. Chapter 5 presents a practical review of the theory of moiré used for strain measurements. This chapter also introduces the concept of moiré deflectometry, which is greatly expanded in Chap. 6. Chapter 7 provides extensive discussion on the application of moiré deflectometry to such areas as flow analysis, transparent objects, MTF measures, and, in an appendix, to the measurement of aberrations.

The topic of moiré deflectometry, for which the authors are well recognized, is presented in a clear and useful manner. Because more than half the book is dedicated to the subject of moiré deflectometry, one gets the feeling that the other material is presented as background, which is quite effective. The extreme briefness of the coverage of other uses of moiré might leave the practitioner wanting, but the needed theory is there. Those interested in the topics of moiré contouring, projection methods, holographic moiré, or automated analysis methods will not find the material or references they may need. However, as a brief introduction to the topic of moiré theory (the interaction of light and gratings) and as a thorough reference on the important new field of moiré deflectometry, this book provides a broad picture that puts moiré into context with other optical methods.

### Introduction to Nonlinear Optical Effects in Molecules & Polymers

Paras N. Prasad and David J. Williams, 320 pages, illus., subject index, references after each chapter, two appendixes. ISBN 0-471-51562-0. John Wiley & Sons, Inc., 1 Wiley Drive, Somerset, NJ 08875-1272 (1991) $49.95 hardbound.

**Reviewed by P. R. Hemmer,** Rome Laboratory/EROP, Hanscom AFB, MA 01731.

This book covers the complex, interdisciplinary topic of nonlinear optics of organic materials in a detailed and comprehensive manner. Both theory and experiment are covered, and third-order $X^{(3)}$ as well as second-order $X^{(2)}$ nonlinear optical processes are considered. In general, the text relies heavily on equations and contains many brief summaries of important publications in the field. Fortunately, intuitive physical explanations are also given to aid in the understanding of important or difficult concepts. The book should serve well as a reference for those currently working in any part of the field of organic nonlinear optics or for those newly entering the field, such as graduate students. However, those merely looking for an entry-level overview might find the text overly detailed.

The book consists of 13 chapters, the first of which is a brief overview of the field of organic nonlinear optics. Chapters 2, 3 and 4 consist of background material. Chapter 2 covers nonlinear optics in general, Chap. 3 covers microscopic nonlinear optical properties of organics, and Chap. 4 addresses how microscopic properties are modified in bulk media. These background chapters are followed by detailed discussions of second-order nonlinear optical processes in Chaps. 5, 6, and 7 and third-order processes in Chaps. 8, 9, and 10. In both cases, there are separate chapters for (1) the basic theory of important nonlinear optical interactions, (2) the standard experimental techniques used to characterize materials, and (3) surveys of the properties of representative materials. Chapter 11 examines both second- and third-order nonlinear optical processes in guided wave materials. Chapter 12 highlights the most popular device applications of nonlinear optics, and the final chapter contains a brief summary and suggested future directions.

In summary, this book takes on the difficult task of presenting the rapidly developing interdisciplinary field of nonlinear optics in organic materials in terms that both chemists and optical physicists/engineers can grasp. The end result is a book that is comprehensive and detailed, but which also attempts to provide an intuitive feel for important concepts.