references to earlier papers that now are not well known. He does not usually indicate, however, who was the first to use a new approach. For example, he refers to E. N. Rowland's discussion of Campbell's theorem published in 1936, whereas N. Campbell published his original theorem in 1909 [*Proc. Cambr. Phil. Soc.* **15**, 117, 310, 513 (1909)].

Readers who make the effort to assimilate this readable book will be rewarded by gaining valuable insights that will help them directly in their work or lead them to the study of new topics. For these reasons I recommend the book to physicists and engineers either working in the field or having an interest in gaining an understanding of it.

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Optical Holography: Principles, Techniques and Applications

P. Hariharan

319 pp. Cambridge U. P., New York, 1984.
ISBN 0-521-24348-3 $75.00 hardcover;
ISBN 0-521-31163-2 $24.95 paper

Sixteen years ago, a book entitled *Optical Holography*, by R. J. Collier, C. B. Burckhardt and L. H. Lin of Bell Laboratories appeared, and soon became the bible of that fledgling science. It has since been reprinted in paperback, and is still widely referenced. P. M. Hariharan, by his choice of title, invites comparison to that earlier volume; Hariharan's book has a similar format and rigor (and is also now in paperback). A quick scan of their indexes provides a fascinating synopsis of the progress over the years. New topics include dynamic holography; four-wave mixing and phase conjugation (although holographers were on to this well before those scientists dealing in nonlinear optics); rainbow, sandwich and multiplex holograms; pseudocolor imaging; heterodyne interferometry; holo-scanners; silver halide gelatin; and photorefractive crystals.

But this newer volume is much more than an update. Hariharan is a distinguished photographic scientist who joined W. H. Steele's group at Australia's CSIRO labs in the mid-1970s and undertook a widely ranging study of the theory and applications of optical holography. His work on novel processing techniques for holographic materials to produce high-efficiency, low-noise results has been particularly influential. He has also made important inventions and offered refinements to both rainbow and reflection white-light holography, and also to the

achievement of high-precision holographic interferometry. His interests are reflected in his emphasis of topics and in their treatment, which is less influenced by electrical engineering and more by physics than are many comparable treatments of holography. While there is adequate analytical discussion, there is less mathematics and more excursions into practical techniques than in the book by Collier, Burckhardt and Lin. It is a much shorter book, with a rich bibliography and reference sections to which many proofs and details are deferred. Indeed, beyond its introductions to so many topics, the book serves as a valuable annotated guide to the extensive literature of the field (through 1982, although patents are excluded), enlightened by a good sense of what matters and what works.

Hariharan's book is not a text, not a handbook. It is a comprehensive, stylistically unified and still timely survey of the scope of optical holography, reflecting a style of intellectual endeavor that has proven very fruitful. This book should be particularly useful to those who have had some brush with the conceptual underpinnings of the field (the hour or two in typical physical optics courses, for example) and wish an initiation into their wider implications.

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Optical Fiber Communications: Principles and Practice

John Senior
558 pp. Prentice–Hall, Englewood Cliffs, N. J., 1985.
ISBN 0-13-638248-7 $45.67 hardcover

Optical fiber communication has grown from an exotic research field to a powerful industry. It is widely used today in terrestrial and submarine long-distance communications, and is beginning to penetrate local communications markets. Future optical fiber networks may bring high-definition television, videophones and a host of other advanced services to our houses. Timely dissemination of information about this developing technology is an important and difficult task complicated by an explosive rate of development. Textbooks are needed to familiarize students with fiber communications, and reference books are needed for practicing engineers. Several recent books are addressing this important need. These include *Optical Fiber Transmission Systems* by S. D. Personick (Plenum, New York, 1981; reviewed in PHYSICS TODAY, March 1982, page 66), *Optical Wideband Transmission Systems* edited by C. Baack (CRC, Boca Raton, Fla., 1986), *Introduction to Optical Fiber Communications* by Y. Suematsu and K. I. Iga (Wiley, New York, 1982), *Optical Fiber Communications* by G. Keiser (McGraw–Hill, New York, 1983) and *Transmission of Information in the Optical Waveband* by L. Kazovsky (Wiley, New York, 1978). John Senior's recent text is a welcome addition to the fiberoptics library.

Senior's book was designed as an introductory text and is generally successful; the style is clear and straightforward. Senior successfully explains many of the complex issues facing fiber communications professionals without losing the student in less significant issues. The subject of optical waveguides is particularly well covered (chapters 2–5). While the treatment is not as deep as that of full-size textbooks on this subject—such as that given in *Optical Waveguide Theory* by A. W. Snyder and J. D. Love (Methuen, New York, 1984)—it is clear and fairly comprehensive.

However, the book is not free from shortcomings. It can hardly be called balanced: Of the ten "main" chapters (not including chapter 1, which is an introduction), four are devoted to fibers, while remaining topics are squeezed into the other six chapters. An instructor interested in balanced coverage will have to skip a large part of the fiber material. Most of chapter 4 on fiber and cable manufacturing can be omitted easily as other chapters do not use this material. A serious drawback is an insufficient treatment of systems issues. For example, the impact of laser mode-partition noise, finite spectral width, chirp and other imperfections is not analyzed in sufficient depth, leaving the reader without a good understanding of the major limiting factors in optical communication systems. An unfortunate corollary is that the reader has no means to appreciate the advantages and disadvantages of the various devices presented. The treatment of many relatively new issues, such as coherent systems, optical amplifiers and integrated optics, is shallow.

For classroom use, the book provides problems at the end of chapters 2–10; many of these problems ask the student to "discuss" or "describe" rather than "calculate" or "show that." I prefer the "calculate" and "show that" problems: They reveal better the student's knowledge and understanding, and make grading more objective.

When teaching a senior-level or first-year graduate course on optical fiber communications, I would use this book together with another text, such as *Optical Communication Systems* by J. Gowar (Prentice–Hall, Englewood Cliffs, N. J., 1984), to provide a balanced treatment of this important subject.

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An Introduction to Chemisorption and Catalysis by Metals

R. P. H. Gasser
260 pp. Clarendon, Oxford, 1985.
ISBN 0-19-855163-0 $49.00 hardcover;
ISBN 0-19-855271-8 $24.95 paper

As implied by the name, this book is an introduction to a currently active area of surface studies—examination of the chemical interactions between gases and metals. The primary emphasis is on the kinetics of molecular processes, descriptions of which occupy roughly two-thirds of the book; the remainder is devoted to brief presentations of techniques for making surface measurements, as well as to outlines of surface crystallography and the electron theory of metals. The discussion of the chemical kinetics of surface processes is well done. Gasser starts with sketches of the collisional events when a molecule from the gas encounters a surface. He then examines adsorption and desorption in some detail, and provides examples of what has been learned about simple chemical systems by these methods. After brief descriptions of techniques for structural and spectroscopic analysis, Gasser devotes the last part of the book to examples of how the ideas and techniques presented earlier have been used in examining surface reactions involving hydrogen and also carbon monoxide.

Because of the rapid pace of current research on gas–solid interactions, books like the present one are rare. Closest in scope and level is *The Kinetics of Heterogeneous Catalytic Reactions* by Michel Boudart and G. Djéga-Mariadassou (Princeton U. P., Princeton, N. J., 1984). In that book the emphasis is on catalytic processes. The present work stresses chemisorption, and offers a rather broader view of recent surface studies, so that there is little overlap.

In Gasser's examination of chemical kinetics on metals, he conveys a feeling for how problems have been and are being tackled. Even the uninitiated can get a feeling for the field. The occasional comparisons with processes in the gas phase are helpful. Nevertheless there are deficiencies. Much progress has been made in recent years; however, work done since 1981 is not