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

included, and that is regrettable. More significant deficiencies can undoubtedly be attributed to the book's genesis as lecture notes: For different topics the level of presentation is quite uneven. The discussions of kinetics are reasonably detailed, for example, while techniques are sketched much more broadly. Perhaps much of the material on techniques should have been omitted. Elementary presentations are available, in Martin Prutton's book *Surface Physics* (Oxford U. P., New York, 1983), for example, and the space gained could have been devoted to a more intensive examination of kinetics. In its present form the book does not offer the topical insights into current problems that an expert such as Gasser could provide, even in an introductory exposition. Furthermore, the references to the literature are not adequate. The reader gets an impression neither of how the field developed historically nor of good sources for keeping up with current studies. Poor editorial work mars the limited citations that are offered. Despite these failings, I certainly recommend this book to new graduate students interested in entering upon chemical surface studies—it offers a quick, well-written and much needed introduction.

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## book note

**McGraw-Hill Encyclopedia of Science and Technology, Volumes 1–20**
**Edited by Sybil P. Parker.** Sixth edition. 12 807 pp. McGraw-Hill, New York, 1987. ISBN 0-07-079292-5 $1600.00 hardcover

Now in its sixth edition, the *McGraw-Hill Encyclopedia of Science and Technology* has expanded in five years from 15 to 20 volumes. The encyclopedia includes both an analytical index and a topical index (arranged by subject). About 3500 contributors, including 20 Nobel Prize winners, provide summaries of well-established topics in science and technology. New entries in this edition in physical science and technology include catastrophe theory, computer vision, fractals, inflationary universe cosmology, the intermediate vector boson, nonlinear optical devices, proton-induced x-ray emission and the Weinberg–Salam model.

What is the intended readership? The preface tells us that the encyclopedia is addressed to the reference and educational needs of students, professionals and librarians. An encyclopedia can offer its readers an authoritative introduction—although necessarily brief—to many topics outside each scientist's narrow specialty. Based on several samples, the references listed at the end of most articles vary considerably in the background required for comprehension. Bibliographies are said to have been revised and updated as needed, but in at least some cases, the average reference appears to be about ten years old.

The encyclopedia emphasizes the technical aspects of science, so the reader looking for history, personalities or philosophy will be disappointed. But for the beginning or confirmed browser in science, the multidisciplinary scope of the encyclopedia is its great appeal. For very specific, highly technical treatments, the reader will need to look elsewhere.

—PER H. ANDERSEN