bolts of gravity wave stress tensors and other such applications of approximate forms of the theory. Such material is abundant in *Gravitation* by Charles W. Misner, Kip S. Thorne, and John A. Wheeler. Indeed, I would recommend *Gravitation* and Steven Weinberg's *Gravitation and Cosmology* as companion references for a course based on Wald's new text.

JAMES W. YORK JR
University of North Carolina at Chapel Hill

Constructing the Universe

David Layzer
313 pp. Scientific American Books (Freeman), New York, 1985.
ISBN 0-7167-5003-1. $29.95

Scientific American is an interesting magazine, but reading it is not without frustrations for the average scientist. I have found that I can follow articles in my own field of physics or in the earth sciences, and that I can learn a great deal from them. On the other hand, I long ago gave up even attempting to read articles in molecular biology, because they are written at a level far beyond my ability to follow. My conversations with other working scientists lead me to believe that they have a similar experience. David Layzer's *Constructing the Universe*, a book in the *Scientific American* library, shares the strengths and weaknesses of its parent publication.

As the title suggests, this is a book devoted to an explanation of the evolution of our ideas about the physical universe, with special emphasis on ideas about cosmology and cosmogony. The book is handsomely illustrated and supplied with diagrams in the manner of articles in *Scientific American*. It traces our ideas about the universe from Ptolemy and his Greek contemporaries to modern views of the Big Bang and early universe. The average physicist will, I think, have little trouble following the development of this story. He may also find that much of the historical material is both interesting and new.

In my reading, however, I found that I was continually asking myself the question "for whom is this book intended?" If it is intended as a handbook for working scientists, then the lavish illustrations and four color graphics seem out of place. If it is intended as a book for the average layman—as an introduction to the history of science—then complex mathematical concepts such as vector notation and potential energies also seem out of place. Finally, if it is intended for use as a textbook in an astronomy course, why then are there no problems or discussion questions at the end of the chapters?

I suspect that the answer to these questions is that the book is intended for the same audience that reads *Scientific American*, or rather, the subset of that audience that reads the physical science articles in *Scientific American*. For that audience this book is ideal—what would bother the average reader will not be worrisome for them. For example, Layzer spends an entire chapter discussing complex philosophical points about the role of scientific theory before he ever presents a single theory for consideration. The book will play the same role as the familiar *Scientific American* to readers—that is, it will serve as a useful reference book, a source of diagrams and illustrations to illustrate difficult points in astronomy, and as a book that will fill in the blanks in what is already a more or less complete education. If you feel the need for this sort of book in your library you could do a lot worse than buying *Constructing the Universe*.

JAMES S. TREFIL
University of Virginia

Polarized Light in Nature

G. P. Können
(translated from the Dutch by G. A. Beerling)
172 pp. Cambridge U. P., New York, 1985.
ISBN 0-521-25862-6. $32.50

This is a visually attractive book, lavishly illustrated with color photographs, as befits its subject and its apparent intended audience—the intelligent layperson. Alas, upon reading, one soon finds that the text does not live up to the pictures; you can't judge a book by (just) its photographs. The writing style is weak, and in places discursive and repetitive—surely something must have been lost in the translation from the 1980 original.

But the drawbacks are even more fundamental. Many of the explanations are confusing or incomplete, even the more technical ones presented in the last half of the book. Few readers who do not already know the relevant physics will fully understand Können's explanation of the formation of the rainbow and Alexander's dark band, for instance, or even his explanation of polarization itself. [For atmospheric optics, readers should stick with Robert Greenler's *Rainbows, Halos and Glories* (Cambridge U. P., 1980).] Several times an "explanation" consists instead merely of a description, as for the Zeeman effect. Some phenomena are mentioned but not explained at all: Why is light from artificial satellites polarized as much as 40%?

For a book that is "the first attempt to compile a guide to polarization" (as claimed in the introduction), the refer-

Broken rainbow in raindrops and ocean spray. This photograph by J. Dijkema appears in *Polarized Light in Nature*. (Photograph reproduced by permission of the author.)

ences could have been more inclusive. For instance we're told "[John S.] Hall and [William A.] Hiltner found that the light of stars is slightly polarized." Because no further mention of these scientists—and several others—is made, we deserve clear references to their original work. *The Atlas of Optical Phenomena* by Michel Cagnet and others merits citation, for example, and it would have been helpful had this 1985 translation of Können's book cited books by Jearl Walker, Kurt Nassau, Sam Williamson and Herman Cummins and any of a number of standard texts on physical optics.

As mentioned above, the book's strength is its color plates—nearly 90 of them. My favorite shows a "split" rainbow viewed over the ocean; the falling raindrops visible above the horizon produce one section of rainbow while the nearby salty ocean spray below the horizon produces another. The sections do not exactly match, due to the difference in index of refraction between the two types of water (and hence in the radii of the rainbow sections they produce).

There are, moreover, some fascinating phenomena described; we read of the rose chafer beetle, whose circularly polarized gloss results from helical molecules in its wing cases, and of the ubiquitous (but rarely observed) cloud bow, rendered visible through a Polaroid filter.

The people who will profit most from *Polarized Light in Nature* will be those who already know and understand the fundamental optics but may not be familiar with some of the "real world" phenomena. The book therefore can be recommended to teachers of optics—at any level—who wish to find material to supplement their courses, as well as to the ambitious student who is willing to do supplementary reading. Many other readers, though perhaps frustrated by the book's weak explanations, will find the photographs a delight.

DAVID G. STORK
Clark University

The Laser Guidebook

Jeff Hecht

381 pp. McGraw-Hill, New York, 1986.
ISBN 0-07-027733-8. $49.50

The primary emphasis in this book is on functional characteristics of the wide variety of lasers available commercially. Separate chapters are devoted to all of the usual and some of the less usual generic types, from helium–neon to color-center lasers. All of these chapters have a common format, with an introductory section giving information on the active medium and the energy transfer process fundamental to the lasing action, followed by sections detailing internal structure, beam characteristics, operating requirements, reliability and maintenance, typical prices (as of 1985) of normally available systems, and typical applications. The book begins with six chapters providing a brief overview of the history of lasers and basics of laser theory. Chapter bibliographies are provided, and in the appendices there is a glossary of laser and optics terms and a summary of the output type (cw or pulsed) and power of lasers producing specific wavelengths. I am aware of no other volume of similar format.

Hecht's writing is appropriate for his intended audience, people seeking general background information on commercially available lasers. He says that the book is intended both as a tutorial and a reference and that readers "seeking to learn the basics of lasers and optics should start by reading the first few overview chapters, then dig into the descriptions of specific lasers to see how they really work." It serves the second function well, the first not as well: I doubt that someone completely unfamiliar with lasers would find the introductory material adequate for working with them. The chapter bibliographies list a wide variety of references ranging from a volume introducing the uninitiated to lasers to citations from *Physical Review Letters*. Unfortunately, the references are undifferentiated and largely unannotated and as such would be of limited use to readers not already familiar with the field. Similarly the glossary, although extensive, does not include all the undefined terms used in the text and some of those included are imprecisely described at best.

Hecht deliberately and wisely refrains from mentioning trade names in his discussions of commercially available lasers, because the laser industry is still very much in flux. He refers readers interested in using specific types of lasers to industry directories for locating manufacturers. I think he has omitted a valuable intermediate step by failing to mention the comparisons of brands of specific kinds of lasers that frequently appear in trade magazines. Reference to these would have been an important addition to the chapter bibliographies.

Safety is mentioned as one of the operating requirements for each type of laser, but not with the emphasis I think it deserves. It is a matter with which any inexperienced user of lasers should be completely familiar.

The book—despite these criticisms and shortcomings—can still be recommended. The information presented is on the whole useful and accurate and the chapters on specific laser types are certainly well organized. It would be a worthwhile addition to a technical library and for teachers of lasers or laser-related courses at the beginning or intermediate level, and it would serve well as a reference to supplement classroom work or as a bridge between classroom and laboratory. Even for a field as rapidly evolving as laser technology, it could pay its way before becoming outdated.

DONALD C. PECKHAM
St. Lawrence University
Canton, New York