The writing is not uniformly clear. Some passages will confound the student. For example, on page 11 it is stated that to calculate the intensity of light in terms of the field amplitudes in a sinusoidal plane-wave field requires "integrating over space, and taking the limit as time goes to infinity." In connection with phase retardation as light travels an isotropic medium or vacuum, one reads on page 40 to "remember that retarded refers to velocity, and since frequency is constant a larger number of oscillations (and hence more phase angle) are required to traverse the same space." In discussing phase shifts associated with total internal reflection, the authors state on page 246: "The storage of energy corresponds reasonably to a phase shift, since phase shift necessarily is introduced when the evanescent wave is formed."

On page 243 the discussion of external-reflection phase shifts at a dielectric surface is also confusing. For light reflection at a metal surface, the authors confuse, on page 248, the pseudo-Brewster angle with the principal angle and claim that the principal azimuth "is not unambiguously defined." The quarter-wave retardation is indicated as $\pi/4$.

Despite its limitations, this book provides another useful source from which to learn some of the standard tools for solving problems in polarization optics and some fundamentals of polarized light spectroscopy and its applications, mainly in chemistry.

RASHEED M. A. AZZAM
University of New Orleans

Optical Computer Architectures: The Application of Optical Concepts to Next Generation Computers

Alistair McAulay
Wiley, New York, 1991. 531 pp. $49.95 hc ISBN 0-471-63242-2

This is a comprehensive text authored by a prominent contributor to the field of optical computing. It is written in the style of Dror Feitelson's *Optical Computing* (MIT P., Cambridge, Mass., 1988) but McAulay's book is deeper in a number of areas and is oriented more toward the electrical engineer than the computer scientist. The book is divided into three parts: background for optical computing; subsystems for optical computing; and architectural models of computation. The 18 chapters are divided roughly evenly among the three parts, and an appendix is included on the derivation of the conjugate-gradient method. The author provides an excellent reference list that covers the breadth of the field, although it is somewhat odd that no reference is made to Feitelson's book.

The target audience appears to be those with backgrounds in electrical engineering. The optics introduction is too topical for computer scientists, and the digital logic introduction is too topical for physicists, but the introductions are just right for electrical engineers.

Part I starts out with a brief discussion of the needs of future computers and why electronics technologies will have difficulties meeting those needs. The advantages of optics in computing include greater speed, because there are no capacitive loads to charge, and improved cooling, because fast communication allows for greater device spacing. The book's introduction to optics is well tailored for optical computing, although the reader should have some background in optics, at least at the college physics level.

Topics include wave phenomena, interactions with media (reflection, refraction and diffraction), polarization, lens systems and Fourier optics. The author discusses the use of holograms for storing data and connections as well as spatial light modulators and their characteristics. McAulay includes an up-to-date table that compares characteristics and discusses digital versus analog computing as it relates to optical computing. Devices other than spatial light modulators, such as deformable mirrors and acoustooptic devices, are also discussed. In general, part I provides good, qualitative descriptions of some leading devices. Each topic in part I is covered in enough depth to gain an understanding of its relevance to optical computing and offers a good introduction for those working in the field who are unfamiliar with some areas.

Part II focuses primarily on optical subsystems for computing logic functions by means of global and local interconnects. Part II begins with optical interconnections based on crossbar switches, $\log_2 N$ interconnections and multistage interconnection networks. The author introduces the concept of memory in the form of random access, associative, cache and virtual memories. Holographic memory and the construction of holograms are discussed. There is a good discussion of computer arithmetic as it is done in real computers, including number representations and techniques for optical computer arithmetic, with an emphasis on addition.

Part III begins with a history of computers and moves into a discussion of reduced instruction-set computer machines. The author presents his design for an optical reduced instruction-set computer and suggests this design may be the first. He introduces the concept of dataflow computers and describes electronic dataflow architectures, providing background for hybrid optoelectronic implementations of the static dataflow architecture. Chapter 15, on optical cellular automata, is a good representation of the ongoing work in this area. It is curious that so much of this work involves optics when in fact nearest-neighbor computation is a good match for conventional electronics.

Unlike numerous edited books in the field, the author has organized *Optical Computer Architectures* to serve as a textbook, and he includes exercises at the end of each chapter. The topics of the exercises are well chosen, but the gap between what is discussed in the text and what is challenged in the exercises is too great for the exercises to serve as an effective pedagogical device unless an expert is teaching the course.

In terms of form and style, the general flow is logical, starting with background and motivations, building up to optical devices finally leading to complete systems. As can be expected, the untested ideas are saved for later chapters. The use of language is generally good, although the author alternates between present and past tenses and between first-person singular and first-person plural. There are over three dozen typographical and sentence construction errors, ranging from double periods to the use of the word "emitted" where "omitted" is intended. Although somewhat disconcerting, the errors are few in relation to the length of the text (531 pages) and in consideration of the fact that this is the first edition of the book.

MILES MURDOCCA
Rutgers University

Comet Halley: Investigations, Results, Interpretations

Edited by John W. Mason
Ellis Horwood, New York, 1990.
Volume 1: Organization, Plasma, Gas. *$110.00 hc*
ISBN 0-13-171075-3
Volume 2: Dust, Nucleus, Evolution. *$110.00 hc*
ISBN 0-13-171083-4

The return of Halley's comet and the various ground, air and space missions involved produced a great quantity of new, high-quality data. This achievement required the efforts of several thousand astronomers and technical people from more than 50 countries plus many more amateurs worldwide. These two volumes condense the results of these efforts into 570 pages, the third such compilation. (The first, some 1608 pages long, contains technical papers presented at an ESLAB symposium held in Heidelberg, West Germany, in October 1986. The second compilation condensed these papers into 936 pages and was published by Springer-Verlag in 1987.)

The authors of the 39 scientific chapters in the current two volumes are largely principal investigators of experiments on the missions, or were