The programs run relatively slowly but usually give the numerical results together with a graphical presentation of the solution. The graphical presentations increase the user's appreciation of both the physics problems being solved and the power of the numerical techniques. It is difficult to express in words the drama of watching a wave packet tunnel through a barrier (even if it did take over three hours) or seeing a small perturbation change the energy levels of the symmetric wavefunctions in a square well.

The combination of text and software adds a new dimension to learning. Koonin has combined a series of fairly sophisticated physics problems with equally sophisticated computer programs to make *Computational Physics* fun—and it is not often that a book aimed at the advanced undergraduate can be called fun.

PETER B. KRAMER
Cambridge Research Laboratory

Fiber Optics: Technology and Applications

Steward D. Personick
251 pp. Plenum, New York, 1985. $45.00

In *Fiber Optics: Technology and Applications*, Stewart Personick presents a very good overview on fiberoptic technology and communication systems. The book was written for a short course for people who want to get acquainted with this field. It is definitely not a book with in-depth information for researchers who are looking for answers to specific problems.

This book is composed of two parts: Part I provides a brief introduction to various components such as optical fibers, connectors, cables, light sources, detectors and receivers. Part II describes various concepts of fiber-optical systems, including telecommunication trunking, data links, local-area networks, telemetry, sensing systems and some broad-band networks.

Following a brief introductory remark, Personick discusses fiberoptic hardware in several chapters, starting with a qualitative description of fibers as optical waveguides and an introduction to techniques for drawing, cabling, splicing and connecting fibers. There follows a brief description of light sources—light-emitting diodes and laser diodes—and simple circuits commonly used for these sources. The book next covers the output characteristics of the two most common detectors—APD and p–i–n photodiodes—along with a reasonably comprehensive discussion of optical receiver design. Personick also describes a few basic fiberoptic components such as couplers, dividers, multiplexers and switches—with good illustrations for the configurations of these components. After a short chapter pointing out some of the noise problems in optical-fiber communication systems, Personick describes a variety of fiberoptic telecommunications trunk systems that use the optical components introduced in the earlier chapters. Subsequent chapters deal with fiber data links between computer terminals; local-area networks (including several examples of LAN designs using various types of star couplers); analog signal links for video, telemetry, and i f and rf systems (including a discussion of performance requirements for an ideal analog system); and broad-band networks such as CATV, video distribution networks and loop carrier systems. Personick then discusses a few fiber sensors and materials, merely scratching the surface of this group of devices; routine fiber-loss measurement techniques using both the transmission and reflection approaches; and the technique for measuring the fiber bandwidth. The last chapter gives a brief introduction to emerging technology involving integrated optoelectronics, ultra-high-speed switching and optical heterodyne techniques.

In summary, this book gives a very broad overview of the entire field. For those who want simply to get a taste of the subject, the book will serve very well. I am disappointed that it does not treat any of the above-mentioned topics in depth. A comprehensive textbook on fiberoptic telecommunication systems for systems engineers would be very much in demand, but this book does not fulfill that need.

P. K. CHEO
United Technologies Research Center
East Hartford, Connecticut

Foundations of Radiation Hydrodynamics

Dimitri Mihalas and Barbara Weibel Mihalas
718 pp. Oxford U.P., New York, 1984. $75.00

That radiative transfer coupled with fluid flow is important in a variety of astrophysical phenomena—most notably, supernova explosions, accretion flows and bursts—is apparent even to those not directly involved in building theoretical models for these objects. Yet even among those who to some extent practice this allegedly arcane discipline to blow up, spin up, collapse or pulsate a star, there is some misunderstanding, or rather a lack of understanding, of how to incorporate radiative transport into a reasonably complete calculation.

This problem perhaps stems from poor communication between the radiative-transfer specialists, who devel-

op generalized methods for time-dependent radiative transport, and those astrophysicists who have forgone sophisticated treatments of radiative transfer because of the overall physical complexities of their models.

Clearly what astrophysicists have needed to bridge this gap is an exposition of the subject by people who have made their living in both camps. Thus Dimitri Mihalas and Barbara Weibel Mihalas have hit the scene not a moment too soon with their *Foundations of Radiation Hydrodynamics*.

The purpose and content of the work are clearly stated in the preface:

> In writing this book our primary goal has been to expose the great foundation stones of the subject, and to erect upon them solid, if incomplete, walls of methodology on which others can later build. Accordingly, we have quite deliberately concentrated on fundamentals, and have limited severely the discussion of applications to only a few examples whose purpose is to instruct, to illustrate a point, or to provoke deeper thought.

It is not surprising, then, that much of the book's content is standard fare, easily found elsewhere. The first six chapters of the eight-chapter work are filled with lengthy discussions of basic thermodynamics, fluid mechanics and radiative transfer. The authors' efforts toward thoroughness are evident from the sheer amount of mathematical finery accompanying most of the discussions, and these efforts are successful insofar as each important result is derived systematically, rigorously and in enough detail to satisfy most readers unfamiliar with the subject. The unprepared reader is advised, however, to learn these fundamental topics from other, well-known sources (which are likely to offer more physical elegance and insight, and a more stimulating style of discourse). Still, there are two great advantages to the inclusion of all of these relevant issues in a single volume. First, it is simply convenient to have a compact and fairly complete source of background information. Second, the frequent references to pertinent astrophysical literature in these sections can greatly aid in the assimilation of the physics into one's research.

For the scientist the ultimate task of solving the equations of radiation hydrodynamics is usually quite a monumental one, and no less formidable is the task of formulating them, a subject of much activity over the last few decades. Thus the reader is likely to find chapters 7 and 8 most valuable. This last portion of the book contains perhaps the most complete discussion available of the development, content and basic application of the equations of radiation hydrodynamics in planar and spherical geometry. Chapter 7, entitled "The equations of radiation hydrodynamics," meticulously outlines the derivation of the equations of energy and momentum conservation for a radiating fluid in both inertial and comoving frames and then reviews approximate methods of solution. The authors nicely develop the equations with a fully covariant formalism, giving particular emphasis to the sensitive issue of achieving a set of equations consistent with the desired level of approximation. Throughout this analysis they offer concise explanations of the importance of radiation–matter coupling terms formally of order v/c (ignored in earlier work), and one learns that retaining these terms is crucial to obtaining a physically correct solution at all optical depths as well as to achieving consistency between inertial and co-moving frame representations. A later section in this chapter gives an especially penetrating analysis of second-order diffusion; again the authors stress the importance of retaining terms previously ignored to achieve a correct description of all physical effects, including radiative viscosity, up to this order.

Undoubtedly, for most calculations in astrophysics the sections on computational techniques for the transport limit will serve as an important reference. However, the book's publication coincides with the appearance of fundamentally better numerical methods for computing supersonic flows—we refer to the work of Paul Woodward and Phillip Collela and of Bram van Leer. The authors' neglect of these methods is understandable, perhaps unavoidable, but nonetheless unfortunate. The discussion, which would have been above criticism only a few years ago, gives the misleading impression that there has been little substantial progress on this topic since the ideas of John von Neumann. A reader who wishes to learn about radiation as carefully as presented by the authors will probably want to learn hydrodynamics with equal care.

As stated in the preface, the astrophysical examples discussed—most notably in the illuminating chapter 8, on radiating flows—are confined to low-energy phenomena. The section on nonlinear flows, however, may prove to be valuable to the high-energy specialist as well, because the discussion of radiating shock structure, dynamics and propagation, which includes summaries of current research on supernova explosions, remnants and accretion flows, is extensive. As throughout the rest of the book, the logical manner of presentation for each section of this discussion consists of a body of detailed mathematical statements spiced intermittently with physical interpretation

(appreciated) and many references (greatly appreciated), and ending (quite conveniently for the struggling reader) with a terse summary.

The attention to detail, the thoroughness of discussion and the frequent and persistent references, both to supplementary and to parallel discussions of each topic, as well as to interesting applications, make this volume important for the practitioner of radiative-flow astrophysics. Because it is fairly self-contained, this book is a likely text for a graduate-level course in radiation hydrodynamics; despite the significance of the field, few such courses exist, probably in part because the body of possible textual material is ill-defined.

Radiation hydrodynamics—seemingly by nature—lacks the elegance and exotic flavor of other branches of physics relevant to the study of high-energy phenomena in astronomy; its beauty lies in the pretty pictures one produces from the solutions, however crude and numerical, of a set of complicated nonlinear differential equations. *Foundations of Radiation Hydrodynamics*, while presenting few of these pictures itself, does provide the important drawing instruments. As a general reference for a major subject in theoretical astrophysics, it is unsurpassed; we recommend it without hesitation.

ALBERT FU
W. DAVID ARNETT
University of Chicago

White-Light Optical Signal Processing

Francis T. S. Yu
316 pp. Wiley, New York, 1985. $44.95

Francis Yu is a longtime active researcher in optical processing and has collected in this, his fourth book on modern optics, many of his recent results.

For the most part the material in this text is based on the fact that strictly coherent illumination is not required for optical signal processing. The application of the Van Cittert–Zernike theorem allows one to relax the stringent coherence requirement, although one then has to take artifact noise and other drawbacks into consideration. The book presents the case for performing optical processing with partially coherent or white-light illumination.

The book begins with an introduction to the theory of partial coherence and ends with copious applications. In between, the material is clearly presented and well balanced. It is a pity that all the fine illustrations are in black and white; printing costs must have precluded the use of color.

The text examines early on such topics as coherence requirements, the apparent transfer function and noise performance. A brief sampling of the applications discussed includes color-image deblurring, broad-band matched-filter synthesis and visualization of phase objects. All the major results are well illustrated with photographs and all chapters are amply documented with proper references.

Some readers will no doubt take issue with the material on noise. In fact, a more precise account of noise and its statistical description would have improved the presentation. Moreover, it is dubious whether one can treat granularity as additive noise obeying a Gaussian distribution with an exponential correlation function. Doob's theorem would require some reason for assuming that it is a Markov process.

Nevertheless, on balance the book is an important addition to the field of modern optical processing. The text contains two appendices and no problems.

EDWARD L. O'NEILL
Worcester Polytechnic Institute

book note

Solitons and Particles

Edited by Claudio Rebbi and Giulio Soliani
819 pp. World Scientific, Singapore (US dist. Taylor and Francis, Philadelphia), 1985. $75.00 hardcover; $33.00 paper

"Soliton" is a quite recent term for a wave phenomenon already described by J. Scott Russell in 1842. It was coined by Norman J. Zabusky and Martin D. Kruskal in a 1965 paper in *Physical Review Letters*. Around the same time, physicists started applying the soliton concept to particle physics, for example, in a paper that T. H. R. Skyrme published in *Nuclear Physics* in 1962. Both papers are published in *Solitons and Particles*, a collection of reprints on soliton theory and solitons in particle physics. In addition to the 76 reprinted papers, the book contains an introductory chapter, an outline of the mathematical theory of solitons and a guide through the literature of solitons in particle physics.

The editors note that in selecting the papers they have tried to provide "a broad and yet coherent panorama of concepts, methods and results." Consequently, the reprinted papers are not arranged chronologically but divided roughly into groups with topics ranging from the mathematics of solitons to their application in the description of monopoles. The introductory chapters serve as a guide to the study of the field by directing the reader through the text to the reprinted papers and to papers, review articles and books listed in bibliographies with each chapter.

new books

Acoustics

Fundamentals of Noise Control Engineering. A. Thumann, R. K. Miller. 287 pp. Fairmont, Atlanta, Ga., 1986. $29.95. *Text*

Astronomy, cosmology and space physics

Birth and Evolution of Massive Stars and Stellar Groups. Proc. Int. Symp., Dwingeloo, Holland, January 1985. W. Boland, H. van Woerden, eds. 377 pp. Reidel, Boston, 1985. $59.00

Cosmic Rays in Interplanetary Magnetic Fields. I. N. Toptygin. 375 pp. Reidel, Boston, 1985. $64.50

From Quark to Quasar: Notes on the Scale of the Universe. P. Cadogan. 183 pp. Cambridge U.P., New York, 1985. $24.95. *Lay readers*

Guide to Observing the Moon. British Astronomical Association. 128 pp. Enslow, Aldershot, England, 1986. $14.95. *Lay readers*

International Directory of Astronomical Associations and Societies, 1986. A. Heck, J. Manfroid, eds. 266 pp. Observatoire de Strasbourg, France, 1985. *Price not stated*

Solar Radiophysics: Studies of Emission from the Sun at Metre Wavelengths. D. J. McLean, N. R. Labrum, eds. 516 pp. Cambridge U.P., New York, 1985. $59.50. *Compendium*

The Solar System: Observations and Interpretations. M. G. Kivelson. 436 pp. Prentice–Hall, Englewood Cliffs, N.J., 1986. $43.95. *Compendium*

A Brief View of Astronomy. J. M. Pasachoff. 285 pp. Saunders, Philadelphia, 1985. $19.95. *Text*

Data Analysis in Astronomy. *Ettore Majorana International Science Series 24.* Proc. Int. Wksp., Erice, Sicily, May–June 1984. V. Di Gesù, L. Scarsi, P. Crane, J. H. Friedman, S. Levialdi, eds. 541 pp. Plenum, New York, 1985. $85.00

Mass Loss From Red Giants. *Astrophysics and Space Science Library 117.* Proc. Conf., Los Angeles, June 1984. M. Morris, B. Zuckerman, eds. 320 pp. Reidel, Boston, 1985. $49.00

Properties and Interactions of Interplanetary Dust. *Astrophysics and Space Science Library 119.* Proc. Colloq. Int. Astron. Union, Marseille, July 1984. R. H. Giese, P. Lamy, eds. 444 pp. Reidel, Boston, 1985. $64.00

Relativistic Astrophysics. *International Series in Natural Philosophy 10.* M. Demiański. 341 pp. Pergamon, Elmsford, N.Y., 1985. $45.00. *Text*

Atomic, molecular and chemical physics

Progress in Solid State Chemistry, Vol. 15. G. M. Rosenblatt, W. L. Worrell, eds. 374 pp. Pergamon, New York, 1985. $132.00

Organic Structures from Spectra. S.