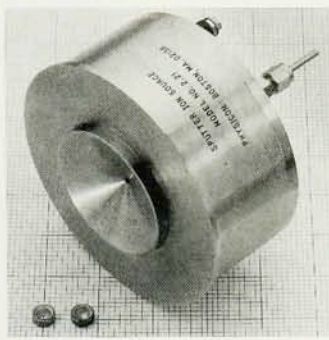


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topics and modern applications. Each chapter has challenging problems at the end, and short illustrative examples of actual devices are interspersed throughout. The book's one fault is its dearth of references: Most chapters contain only 2-5 references to basic texts. More references to original theoretical material and recent experimental work would provide not only additional background on theory when needed, but access to current research in the fields of interest as well. (Some of the desired references include the author's own work.)

In conclusion, this book is a useful text and reference for those working in the field. Those working exclusively with thin-film filters will still be satisfied with the classic texts *Thin Film Optical Filters* by H. Angus Macleod (Macmillan, New York, 1985) and *Optical Properties of Thin Solid Films* by O. S. Heavens (Dover, New York, 1965). These books discuss the production and testing of thin films, which are beyond the scope of Yeh's book. However, for anyone interested in a more complete study of optical thin films, *Optical Waves in Layered Media* will make a fine addition to his or her collection.

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Neutrino Astrophysics

J. N. Bahcall
Cambridge U. P., New York,
1989. 567 pp. \$75.00 hc ISBN
0-521-35113-8; \$24.95 pb ISBN
0-521-37975-X

Most of our information about stars comes from electromagnetic radiation emitted from the stellar photosphere. However, some of the energy emitted (about 2% in the case of the Sun and over 99% in the case of stellar collapse) arrives in the form of neutrinos coming directly from the deep stellar interior. Since neutrinos interact very weakly they are extremely hard to detect, and only recently have experimenters made definite observations of solar and supernova neutrinos. The subject of neutrino astrophysics is just beginning to develop, and the present volume, *Neutrino Astrophysics*, provides a timely introduction to the field.

Raymond Davis carried out the first observations of solar neutrinos using radiochemical techniques in an experiment that started in 1968 and is still going on. John Bahcall has been carrying out the most complete theoretical calculations of the expected rate for over 25 years. An appendix

in the present volume reviews the history of the collaboration between Bahcall and Davis. Very recently the Kamiokande group in Japan has confirmed the Davis results using an electronic detector that identifies the direction of the neutrinos as coming from the Sun.

Bahcall's book provides both an introduction to the subject of solar neutrinos for students and a reference source for researchers in the field. Each chapter of the book is designed to be self-contained even to the extent that identical figures appear in two different chapters. The book provides the basic theory of stellar models, nuclear fusion reactions and neutrino oscillations with an emphasis on the physical principles involved. It also contains the detailed results of the calculations of solar models and detector responses given by Bahcall and Roger Ulrich in the April 1988 issue of the *Reviews of Modern Physics*. In addition to a complete set of references, each chapter contains a carefully selected annotated bibliography.

An interesting and unique feature of the book is a set of questions and answers in the first chapter in which Bahcall gives a somewhat personal viewpoint on a number of issues frequently raised. Chapter 5 provides a comprehensive compendium of non-standard solar models with a brief critique of each.

In spite of its general title, more than 90% of the book is devoted to solar neutrinos. Possible astrophysical sources of high-energy neutrinos, much discussed in connection with the DUMAND (Deep Underwater Muon and Neutrino Detector) and other experimental projects, are not included. One chapter is devoted to neutrinos from stellar collapse, but this is much less detailed than the discussion of solar neutrinos. The main emphasis is on the analysis of the observations of neutrinos from the supernova 1987a made by the Kamiokande and IMB groups. Many issues of importance for plans for observing the next supernova, such as the dependence of time and energy distributions on different supernova models, are not discussed.

Bahcall emphasizes the "solar neutrino problem," which refers to the discrepancy between the Davis observations and the calculated results of Bahcall and his collaborators. Bahcall states that the Kamiokande results confirm this discrepancy; in fact, most people would consider that the Kamiokande results by themselves, while consistent with those of Davis, do not demonstrate a significant dis-

crepancy given the theoretical and experimental uncertainties. Independent of the solar neutrino problem, prospective future experiments on neutrinos from the Sun can provide important information on the solar interior and the properties of neutrinos. This book should serve as the standard reference for this rapidly developing area of research for some time to come.

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NEW BOOKS

Astronomy and Astrophysics

BL Lac Objects. *Lecture Notes in Physics* 334. Proc. Wksp., Como, Italy, September 1988. L. Maraschi, T. Maccacaro, M.-H. Ulrich, eds. Springer-Verlag, New York, 1989. 497 pp. \$55.10 hc ISBN 0-387-51389-2

Men, Monsters and the Modern Universe. G. Lovi, W. Tirion. Willmann-Bell, Richmond, Virginia, 1989. 74 pp. \$24.95 hc ISBN 0-943396-24-7. *Star atlas*

Modeling the Stellar Environment: How and Why? Proc. Mtg., Paris, June 1988. P. Delache, S. Laloe, C. Magnan, J. Tran Thanh Van, eds. Editions Frontières, Gif-sur Yvette, France (US dist. World Scientific), 1988. 350 FF (\$53.00) hc ISBN 2-86332-061-0

Noctilucent Clouds. *Physics and Chemistry in Space 18, Planetology.* M. Gadsden, W. Schröder. Springer-Verlag, New York, 1989. 165 pp. \$79.50 hc ISBN 0-387-50685-3. *Monograph*

Observer's Handbook 1990. R. Bishop, ed. Royal Astronom. Soc. Canada, 136 Dupont St., Toronto M5R 1V2, 1989. 236 pp. \$10.00 US pb ISSN 0090-4193. *Reference for amateur and professional astronomers*

Computers and Computational Physics

Category Theory and Computer Science. *Lecture Notes in Computer Science* 389. Proc. Conf., Manchester, UK, September 1989. D. H. Pitt, D. E. Rydeheard, P. Dybjer, A. M. Pitts, A. Poigné, eds. Springer-Verlag, New York, 1989. 365 pp. \$28.10 pb ISBN 0-387-51662-X

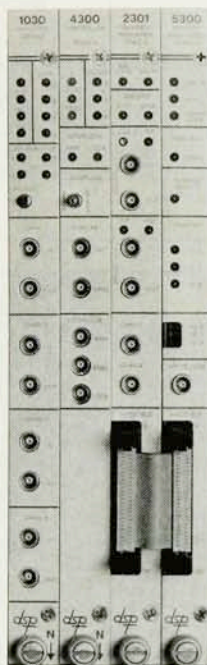
Computational Methods in the Chemical Sciences. A. F. Carley, P. H. Morgan. Wiley, New York, 1989. 337 pp. \$115.00 hc ISBN 0-470-21490-2

Computer Algebra. *Lecture Notes in Pure and Applied Mathematics* 113. Proc. Conf., New York, April 1984. D. V. Chudnovsky, R. D. Jenks, eds. Marcel Dekker, New York, 1989. 240 pp. \$99.75 US (\$119.50 elsewhere) pb ISBN 0-8247-8038-8

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