magnetic theory up to Fermat's principle. The discussion is restricted to isotropic inhomogeneous media throughout.

The author starts with spherical gradients and describes the Maxwell fish-eye lens and the various improvements to it. He revises the general equations and develops a set of ray-tracing equations. These allow normal computer ray-tracing approaches to be used to analyze optical systems in a similar manner to homogeneous lenses. The analysis then moves to axial gradients, with special attention to their use with spherical surfaces. In addition, Marchand discusses the application of thin homogeneous layers for antireflection coatings.

The next section considers radial gradients, in particular the GRIN rod lens. This is followed by further generalizations that allow ray tracing in arbitrary graded index media using numerical procedures. The book also describes third-order aberration theory in some detail. Although the author mentions the importance of fifth-order aberrations for high-quality imaging, the reader is directed to other references for this problem.

The author reviews the somewhat limited design work that has been done so far—one of the major problems being chromatic aberrations. Finally he includes a useful chapter on techniques for fabricating index gradients followed by one reviewing some standard methods for measuring them.

Overall the book is a useful and accurate review of a rather specialized subject. It also confirms that further development is required before these optical elements are found in practical systems.

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Nuclear Energy in Germany

K. Winnacker, K. Wirtz
370 pp. Amer. Nuclear Soc., La Grange Park, Ill., 1979 (German ed., Econ, Düsseldorf, Fed. Rep. Germany, 1975). (Price not stated)

In the introduction to the English translation of their 1975 *Das Unverstandene Wunder—Kernenergie in Deutschland*, authors Karl Winnacker and Karl Wirtz tell us "the acute problems of nuclear energy" are now in the "political arena" (p. *ix*) "The opposition and arguments against the utilization of nuclear energy are increasing to an extraordinary degree and threaten to interfere with an indispensable development." (p. 326) This book is their attempt to counteract the opponents of nuclear power by explaining the science and recounting the history of German reactors. Barry Commoner and the Solar Lobby need have no concern, however. *Nuclear Energy in Germany* is too dull and dogmatic to appeal to the layman and too lacking in scholarship and analysis to interest the general historian. The only class of persons it may benefit are the specialists in the history of German nuclear reactors. They will find diverse items drawn from the files and the memories of two men, Winnacker and Wirtz, who were participants in that history.

The elder author, Winnacker, became an executive of the I. G. Farben company under the Nazis. From 1952 onwards, he served as chairman and then President of the board of Farbwerke Hoechst AG, an important German chemical firm. He was also first president of the German Atomic Forum, a group formed in 1959 to win public support for nuclear power, as well as serving for many years on the German Atomic Commission, which advised the minister for atomic affairs. Wirtz is a nuclear physicist who worked with Werner Heisenberg on uranium piles in wartime during the Hitler period, and subsequently was prominent in German reactor development.

The book divides roughly into three parts. The first chapter and parts of the second and third present the background

by relating the developments of nuclear physics and nuclear technology up to 1955. This material is far more interestingly and more accurately covered in other books in atomic weapons and reactors, Robert Jungk's *Brighter Than a Thousand Suns* and Spencer Weart's *Scientists in Power* come immediately to mind. Chapters 4 through 13 are devoted to the German program within the European context. There are no references, and a great deal of heavy editorializing here, but there are also bits and pieces that are of interest. One such, for example, is an account of Winnacker's conversation with Lewis Strauss, chairman of the US Atomic Energy Commission, during the Geneva Conference on Peaceful Uses of Atomic Energy of 1955. The final part, chapters 14 through 16, tell us why nuclear power is safe ("the experts maintain that modern plants offer such a degree of safety that even if there were an accident or a breakdown, the outside world would be unaffected by the result" (p. 276) and why rejecting it is tantamount to rejecting " all scientific and economic progress." (p. *x*)

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book notes

Electro-Optics Handbook. G. R. Elion, H. A. Elion. 367 pp. Dekker, New York, 1979. $39.75.

This book is a compendium of "previously scattered data concerning electro-optics engineering." As such, it represents one of the first attempts to create a concise, up-to-date source of fundamental information on this specialized field. Among the included topics are electro-optical definitions and symbols; radio- and photometric quantities; sources of radiation; lasers; detectors; image and camera tubes; optical formulae, materials and components; atmospheric and underwater transmittance; displays and arrays; communication systems; specialized components, and computer design of components and systems. —SCA

Atomic Gas Laser Transition Data: A Critical Evaluation W. R. Bennett, Jr. 300 pp. IFI/Plenum, New York, 1979. $75.00

This compilation represents the results of a "tedious project" (Bennett's words) carried out by the author between 1964 and July 1979. Bennett personally scanned about 30 000 abstracts of laser papers and built up a "master file" of about 10 000 reprints. This book references around 1000 of them, and lists reported laser transition measurements categorized under 51 elements. The number of transitions per element ranges from 203 in neon to just one each in bismuth, boron and nickel. The "critical evaluation" of the subtitle refers to the stringent tests Bennett applies to each transition before listing it in his tables; his introduction castigates (unnamed) individuals for the laxity with which erroneous data are published. He mentions grating ghosts and transparency effects on absorbing lines as two of the more common experimental pitfalls. The content of each paper referenced is briefly described, and the papers are grouped according to subject matter in the main reference list. The largest subject group is for "excitation mechanisms and plasma properties in helium-neon lasers" (86 papers)—which led Bennett to add one final reference to this group, perhaps in exasperation. It is to Hebrews 13:8.—JTS

new books

Particles, Nuclei and High-Energy Physics

New Phenomena in Lepton–Hadron Physics (Proc. of a NATO Adv. Study Inst., Karlsruhe, Fed. Rep. Germany, September 1978).