

perimental and theoretical work on many aspects of liquids specializing on liquids under tension, cavitation and superheating. He has written two earlier books, one of which dealt with liquids.

The subject matter includes topics in the statistical mechanics of static and dynamic properties of classical and quantal fluids, hydrodynamics, acoustics, ultrasonics and rheology. Considering the diversity and difficulty of the subjects chosen for the book, it is appropriate to summarize the intentions of the authors. In the preface we find: (1) "The book is designed to be of use to students of both pure and applied sciences at all levels..."; (2) "Research workers, in teaching or industry, ... may use it as a reference book." (3) "A novel and important feature of the book lies in the emphasis on both molecular and macroscopic approaches to liquids and the demonstration of how they complement each other." For a book of 14 chapters, two appendices and an index, all which occupy only 274 pages, it is clear that we should not expect that all three of the objectives quoted above would be realized with equal success.

The level of the material, the limited number of journal references and the fact that neither recent nor current problems are discussed in depth make the book challenging to advanced undergraduate or beginning graduate students and researchers who are new to the general field of liquids. Because of the absence of problems, the book is not suitable as a primary text for teaching. The synthesis of the particular microscopic and macroscopic approaches to liquids chosen by the authors is indeed an important feature and one that will make this book novel for students. It is conceivable that the serious beginner will be encouraged to pursue research along the lines of this juxtaposition.

The late professor John Gamble Kirkwood, to whom the book is dedicated, apparently had considerable influence on H. N. V. Temperley during his visit to Yale in 1952-53. The influence of Kirkwood is manifested in several passages.

Rating the individual chapters is difficult since clarity generally prevails. Nevertheless, on the basis of content, the treatments of intermolecular forces, hydrodynamics, ultrasonics, surface phenomena, mixtures and liquid helium (chapters 3, 6, 7, 9, 11 and 14 respectively) are probably the strongest. The term "liquids" is used rather liberally throughout the book to include gases and liquids as well as models of fluids that show no distinction between these phases.

In summary, Temperley and Trevena have produced a well-written introductory survey of several microscopic and macroscopic approaches to liquids, which should be quite useful to beginners. The book would probably be appropriate for

their personal libraries if it were priced at about 60% of the recommended figure.

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Gradient Index Optics

E. W. Marchand
166 pp. Academic, New York, 1978.
\$16.50

This book reviews the current status of

the rather specialized field of gradient-index media and its application in optical imaging systems. The author describes recent advances in both theory and experimental materials, he does not, however, cover the associated field of graded-index fibers for optical communications. The only fibers discussed are the SELFOC imaging fibers. Erich Marchand has made significant contributions in this field and is realistic in his approach; he provides an accurate and pragmatic picture of the state of the art.

The book has sufficient introduction for readers familiar with basic electro-

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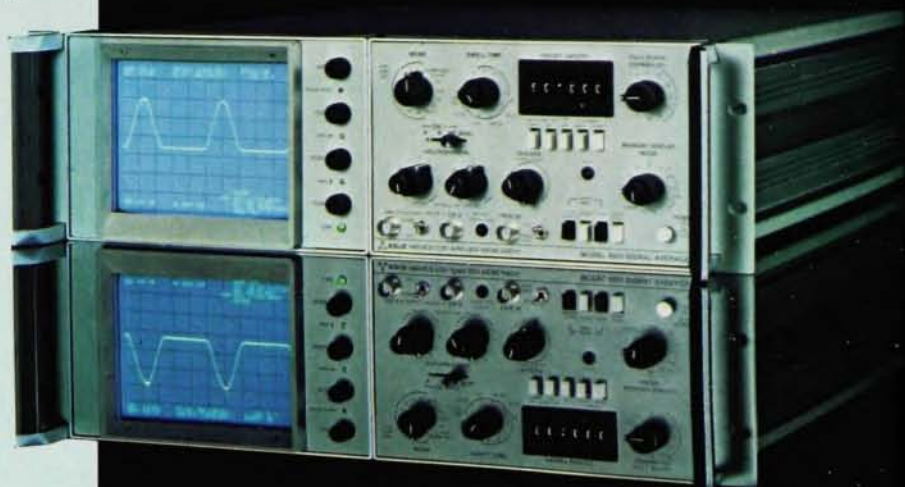
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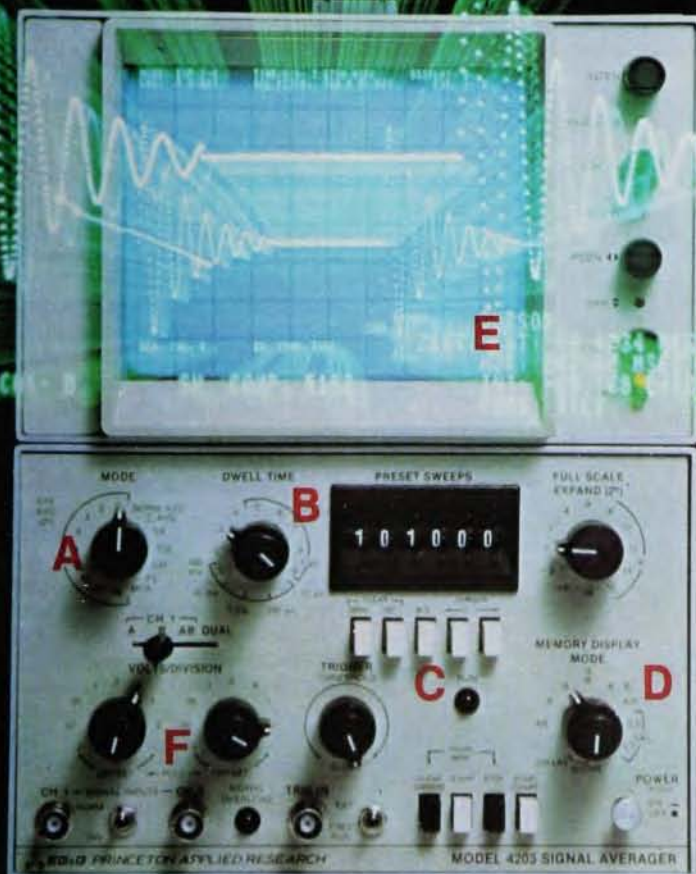
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magnetic theory up to Fermat's principle. The discussion is restricted to isotropic inhomogeneous media throughout.

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 applica-

tion of thin homogeneous layers for anti-reflection 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 Unverständene 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

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