

distribution rather than on its mean. More particularly, Norwich assumes variability at the receptor level to be a power function of mean intensity; thus, while it is understandable why psychophysical laws are expressed in terms of measures of central tendency, this practice is misleading, since it is the change in variance, not the change in mean, that drives the perception of magnitude. One light is perceived as brighter than another because of differences in their entropy or uncertainty: the variability engendered by the bright stimulus is greater than that engendered by the dim one.

Another distinctive feature of this book is the absence of any discussion of the role of contextual and cognitive variables. Through a bottom-up approach Norwich competently treats the physical half of psychophysics while leaving to others the task of addressing the well-known influence of psychological factors. Regardless of whether or not the theory incorporates all the key issues of perception, this book affords us clear insight into the style of reasoning required to see the empirical laws of perception as the natural outcomes of a common, unified theory. Berkeley would have liked it.

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## “Organic Technology”

**Molecular Nonlinear Optics.** Materials, Physics, and Devices. JOSEPH ZYSS, Ed. Academic Press, San Diego, CA, 1993. xvi, 478 pp., illus. \$105 or £81. Quantum Electronics.

Nonlinear optics emerged as a field of study soon after the realization of the ruby laser. Most of its fundamental physical principles, which concern the propagation characteristics of high-intensity light beams, were established during the 1960s. It is now known that the electronic motion induced by electromagnetic fields of high amplitudes is not strictly proportional to these amplitudes. According to perturbation theory, quadratic and cubic nonlinear polarizations may be introduced which are, respectively, quadratic or cubic functions of the amplitudes of the prevailing light waves.

During the '70s, several prototype nonlinear optical devices were developed. Harmonic light generators provided coherent beams in the ultraviolet, optical parametric downconverters served as tunable infrared coherent oscillators, and great progress was made in the development of picosecond and femtosecond pulse generators. Micro-

wave electro-optic modulators and nonlinear propagation studies have contributed to the successful development of optical fiber communication systems. Further progress in all-optical switching techniques and in holographic memory storage and read-out devices will broaden the range of optoelectronic applications.

The field of nonlinear optics has always benefited from a close interaction between physicists and electronic engineers. During the '70s it was discovered that organic materials with long conjugated chains exhibited nonlinear susceptibilities of exceptionally large magnitude. Stimulated by the potential technological payoff, another category of scientists, the chemists, joined the nonlinear optical enterprise. Organic and polymeric materials hold considerable promise for nonlinear optical devices. They can be grown in single crystals or spin-coated to form optical waveguides, which may be integrated with semiconductor laser devices.

Joseph Zyss, coeditor of a 1987 book entitled *Nonlinear Optical Properties of Organic Molecules and Crystals*, has now compiled a new volume that reviews additional developments in the field during the past decade. *Molecular Nonlinear Optics* is intended for readers who are already familiar with the basics of nonlinear optics. It provides a fascinating overview of the large enterprise undertaken jointly by physicists, chemists, and optoelectronic engineers to develop organic and polymeric materials suitable for device applications, including harmonic up-conversion of the output of semiconductor lasers, microwave electro-optic modulators, and all-optical switching devices.

The book is divided into three parts: Fundamentals, Nonlinear Optics in Molecular Media, and Nonlinear Optics in Polymeric Media. “Fundamentals” may be a misleading title for the first part, which covers two special topics not specifically restricted to organic materials. One chapter treats theoretical advances in the nonlinearities of spatially extended excitons influenced by nonlocal many-body effects; the other describes advanced experimental techniques for time-resolved nonlinear spectroscopy.

The remaining chapters run the gamut from basic physical properties through the chemical design of polymeric materials to device configurations using crystalline or polymeric waveguiding films. Considerable attention is paid to poled polymers and their stability. Each chapter is self-contained and is followed by a comprehensive list of references.

Although all the chapters are clearly written, I found Shen's contribution on the orientation of organic molecules at an air-

water interface particularly enjoyable to read. The technique of second-harmonic generation is capable of providing detailed information about surface configurations. It is unfortunate that Shen was unable to include his more recent results based on sum-frequency generation of infrared and visible light beams; it is hoped that another review of the fertile topic of interface configurations will be forthcoming in the near future.

In the preface to this volume Zyss states, “While it may still be premature to predict the nature and extent of application breakthroughs in this field, the last decade has undoubtedly seen molecular nonlinear optics acquire full-fledged scientific status with recognition from both physicists and chemists. . . . This book will have fulfilled its dual goal when supplying state-of-the-art information to the benefit of currently committed scientists while helping renew the field by attracting needed future contributors.” I am confident that this goal will be reached. I recommend the book to active researchers in this branch of nonlinear optics as well as to anyone who is considering entering the field.

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