

DEPARTMENTS

BOOK REVIEWS

Edwin H. Land's Essays: Volume I, Polarizers and Instant Photography; Volume II, Science, Education and Industry; and Volume III, Color Vision

Mary McCann, Ed., Vol. I, 309 pp., Vol. II and III, 269 pp., illus., and references. ISBN 0-89208-170-8. IS&T—Society for Imaging Science and Technology, 7003 Kilworth Lane, Springfield, VA 22151 (1993). Hardbound: \$135, IS&T member \$90, nonmember \$110.

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These books provide a fascinating perspective on the life, career, and contributions of Edwin H. Land. Volume I, *Polarizers and Instant Photography*, is a chronologically ordered collection of Land's publications in these fields. Volumes II and III, *Science, Education and Industry* and *Color Vision*, contain his writings on subjects that are less familiar to this community but had substantial impact in the academic, governmental, and industrial worlds.

The overall quality of the paper, printing, and binding is excellent, and the color plates referenced in both volumes are exceptional. In any text on color vision or photography these are especially appreciated. The organization and editing of the essays was obviously a heartfelt effort, and Mary McCann has done an outstanding job.

Volume I: *Polarizers and Instant Photography*

One might wonder how the 309 pages of Vol. I can be filled with the subjects of polarizers and instant photography. Let me assure the reader that the articles address these subjects exhaustively and provide a great deal of contextual material. The articles are extremely well written, and it is very clear that Land took the task of writing very seriously.

Reading through *Polarizers and Instant Photography*, one gets an evolutionary view

of Land's thinking. In 1994 it is hard to appreciate the difficulty and inventiveness of Land's development of synthetic sheet polarizers. These articles establish a context for understanding the motivation for this work and the development of the technology. The first few articles concern the development of sheet polarizers and their potential application in reducing headlight glare. It moves on to articles on vectographs, infrared polarizers, stereoscopic motion pictures, ultraviolet microscopes, one-step photography (the landmark 1948 JOSA article), "Absolute One-Step Photography" (1972 and 1974), "Introduction to Polavision," and the 60-page chapter from Neblette's *Handbook of Photography and Reprography*. These articles describe in clear detail the technology and applications of polarizers and the developmental history of instant photography.

Many of the enabling technologies for polarizers, such as web coating and handling, were essential to the development of instant photography. Indeed, in Dr. Land's own words, "It was as if all that we had done in learning to make polarizers, the knowledge of plastics, and the properties of viscous fluids, the preparation of microscopic crystals smaller than the wavelength of light, the laminating of plastic sheets, living in the world of colloids in super-saturated solutions, had been a school and a preparation both for that first day when I suddenly knew how to make a one-step dry photographic process and for the following three years in which we made the very vivid dream into a solid reality."

The list of his coauthors in this volume is impressive and includes many names familiar to those in optics: C. D. West, Bruce H. Billings, David S. Grey, W. A. Shurcliff, and R. Clark Jones.

Volume II: *Science, Education and Industry*

This volume contains articles published in a wide range of journals ranging from *Science to Technology Review* to the *Harvard Business*

Review, as well as transcripts of Land's speeches, commencement addresses, his remarks when receiving the National Medal of Science, and congressional testimony. Land's feeling of passion toward science is clearly evident throughout these writings. Land had strong views regarding the role of basic research in small companies. He set forth a model that was revolutionary for that time, and few are aware that he took the time to write about it. The timing of this model (1946) occurred at the same time his company was transitioning from a war-time development and manufacturing mode to undertaking the development of instant photography.

Land's strong social conscience is evident in his commencement address at Carnegie Mellon University (June 6, 1964) entitled "The Two Americas." He presents the challenge of "drawing talent from every part of the population and for developing that talent to its fullest in the service of both the individual and the country."

Land had strong feelings about personal responsibilities and freedom, and his values are truly American. In his "Remarks on the Occasion of His Induction into the National Inventors Hall of Fame" he wrote, "We are becoming a country of scientists, but however much we become a country of scientists, we will always remain first of all that same group of transcontinental explorers pushing our way in from wherever is comfortable into some more inviting, unknown, and dangerous region."

Land's belief in the patent system is hardly a surprise. He had been awarded more than 500 U.S. patents, a number second only to Edison. Patents were essential to the success of his endeavors. His achievements in the fields of polarization and photography would have been substantially muted or arguably impossible without the incentive and protections that patents provide. His article "Thinking Ahead: Patents & New Enterprises" should be read by every entrepreneur.

Volume III: Color Vision

It was with some surprise that I learned on reading this volume that Edwin Land's first writings on color vision date from March 1936 and actually predate his earliest publications on polarizers (June 2, 1936).

His second article in this field dates from 1955 and is a previously unpublished manuscript that describes his first red and white color experiments. Several additional articles further elucidate this subject, and this topic is one in which *seeing is believing*. His description of projecting two images, one from a black-and-white transparency exposed through a red filter and another through a green filter, then projecting the "red" transparency using red light and the "green" transparency using white light, with the observer then perceiving full color, is initially unbelievable. I witnessed his presentation of this as an undergraduate, and it was striking. His development of the retinex theory challenged conventional orthodoxy and to this day still rankles some in the field. This volume contains all of his publications in this area, and it is fun reading.

These volumes individually cover areas in which Edwin Land made a substantial contribution. Taken together, one can begin to appreciate the magnitude of his contributions and intellect and the workings of his mind. To quote Jerome Wiesner's foreword to Vol. III:

Each of the papers in these volumes explicates one of the themes of Land's life-long pre-occupation with science, invention, education, industry and humanity which, together stand as unique testament to the most thoughtful and innovative-brilliant person I have ever known.

No more need be said.

BOOKS RECEIVED

Near Field Optics, edited by Dieter W. Pohl and Daniel Courjon. xiv + 418 pp., illus., subject and author index, references following each paper, an electronic index to the NATO ASI series provides full bibliographical references. Vol. E242 from the NATO Advanced Science Institutes Series. Proceedings of the NATO Advanced Research Workshop on Near Field Optics, Arc-et-Senans, France, October 26-28, 1992. ISBN 0-7923-2394-7. Plenum Press, 233 Spring Street, New York, NY 10013 (1993) \$180 hardbound. Covers screened tip techniques (aperture microscopy), unscreened tip techniques, optical forces, plasmons in near-field optics, instrumental techniques, near-field infrared microscopy, STM and light, related techniques.

Ocean Colour: Theory and Applications in a Decade of CZCS Experience, edited by Vittorio Barale and Peter M. Schlittenhardt. xii + 367 pp., illus., color photographs, subject index, references following each paper. Based on the lectures given during the Eurocourse on "Ocean Colour: Theory and Applications in a Decade of CZCS Experience" held at the Joint Research Center, Ispra, Italy, October 21-25, 1991. From the Euro Courses Series. ISBN 0-7923-1586-3. Kluwer Academic Publishers, P.O. Box 989, 3300 AZ Dordrecht, The Netherlands (1993) \$124 hardbound. An overview of the current status in the field of optical remote sensing of the sea, as well as a forum to debate new ideas and developments for the upcoming ocean color missions. Covers ocean color data, in particular the existing CZCS archives; related algorithms and models; and application demonstration programs.

Singularities in Fluids, Plasmas and Optics, edited by Russel E. Caflisch and George C. Papanicolaou. x + 348 pp., illus, references following each chapter. Proceedings of the NATO Advanced Research Workshop on Singularities in Fluids, Plasmas and Optics, Heraklion, Greece, July 6-10, 1992. ISBN 0-7923-2333-5. Kluwer Academic Publishers, P.O. Box 989, 3300 AZ Dordrecht, The Netherlands (1993) \$158 hardbound. Topics discussed include singularities for the nonlinear Schrödinger equation; near blowup for solutions of the nonlinear Schrödinger equation with saturation, or the Zakharov equations; singularity formation on fluid interfaces and vortex sheets; possible singularities in solutions of the Euler equations for 3-D incompressible, inviscid flow; computation of the formation and propagation of singularities in the complex plane; and computational methods for singularities using adaptive rescaling.

An Introduction to Photonic Switching Fabrics, by H. Scott Hinton, in collaboration with J. R. Erickson, T. J. Cloonan, F. A. P. Tooley, F. B. McCormick and A. L. Lentine. xii + 525 pp., illus., subject index, references and problems following each chapter. From the Applications of Communications Theory series. ISBN 0-306-44379-1. Plenum Press, 233 Spring St., New York, NY 10013 (1993) \$85 hardbound. Covers switching systems; optically transparent devices; optically transparent systems; optical logic devices; free-space optical hardware; and photonic switching architectures based on logic devices (free-space digital optics).

Laser Applications for Mechanical Engineering, edited by S. Martellucci, A. N. Chester, and A. M. Scheggi. x + 436 pp., illus., subject index, references following each paper, an electronic index to the NATO ASI

series provides full bibliographical references. Vol. E238 from the NATO Advanced Science Institute Series. Proceedings of the NATO Advanced Study Institute on Laser Applications for Mechanical Industry, Erice, Trapani, Italy, April 4-16, 1992. ISBN 0-7923-2303-3. Kluwer Academic Publishers, 101 Philip Drive, Norwell, MA 02061 (1993) \$166 hardbound. Includes laser materials processing; tutorials; theoretical foundations; laser cutting and welding applications; other applications: stereolithography, surface hardening, 3-D surface patterning, manufacturing and repairing; laser measurement techniques; laser safety.

Physics of High-Speed Transistors, by Juras Požela. xiii + 337 pp., illus, index of transistor types and their abbreviations, references following each chapter, notation key at beginning of book. From the series Microdevices: Physics and Fabrication Technologies. ISBN 0-306-44619-7. Plenum Publishing Corp., 233 Spring Street, New York, NY 10013 (1993) \$85 hardbound. Discusses the basic physical principles that open the way to increasing operating speed in not only traditional bipolar and field-effect transistors and the latest heterostructural and ballistic transistors, but of what are fundamentally the newest quantum-effect transistors, which are the possible claimants to future electronics.

Theory of Reflectance and Emittance Spectroscopy, by Bruce Hapke. xiii + 455 pp., illus., subject index, bibliography, four appendixes, acknowledgements at beginning of book. From the Topics in Remote Sensing series. ISBN 0-521-30789-9. Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211 (1993) \$125 hardbound. In the introduction, the author explains that the subject of this book is remote sensing, that is, seeing "with clearer eyes." In particular, it is concerned with how light is emitted and scattered by media composed of discrete particles and what can be learned about such a medium from its scattering properties.

Recent Developments in Quantum Optics, edited by Ramarao Inguva. xii + 569 pp., illus., subject index, references following each paper. Proceedings of the International Conference on Coherence and Quantum Optics, Hyderabad, India, January 5-10, 1991. ISBN 0-306-44403-8. Plenum Publishing Corp., 233 Spring Street, New York, NY 10013 (1993) \$139.50 hardbound. Covers quantum optics: theory; squeezed and nonclassical light; cavity QED-lasers and masers; coherence theory; photon statistics and intense field optical resonance; and optical bistability, four-wave mixing and phase conjugation.