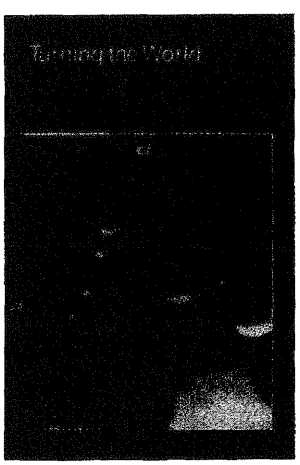
Books for Optics Experimenters

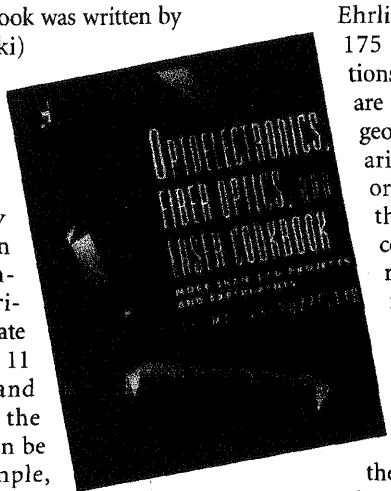
BY MICHAEL E. KNOTTS

In the April 1996 Light Touch column, I gleefully wrote about colorful experiments demonstrating stress birefringence in gelatin. The Nobel prize winner within me secretly hoped that someday I might achieve great fame and fortune for an astonishing discovery made while teaching children—using materials purchased at the local supermarket! Then, as I perused a display at the OSA Annual Meeting a few months later, I was shocked to discover a delightful little book for children by Vicki and Josh Cobb that described polarization experiments with "stressed-out gelatin!" It seems that, as far as educational demonstrations in optics are concerned, the old adage "there's nothing new under the sun" often applies. There happens to be many good books on the market that describe optics experiments similar to those discussed in this column. This month, we'll take a look at five worthy of your attention. A couple of them are out of print, so library call numbers are provided in case you can't find them at your favorite bookstore.



Light Action! Amazing Experiments with Optics

Vicki Cobb and Josh Cobb, illustrated by Theo Cobb, Harper Collins, New York, N.Y. 1993, 198 pp. with index, $16.00. Out of print, but available through OSA. ISBN 0-06-021437-6 QC360.C6 1993.



This excellent book was written by a mother (Vicki) and son (Josh—a former *OPN* contributing editor) team and illustrated by another son (Theo). It contains 65 experiments appropriate for kids about 11 years of age and older. All of the experiments can be done with simple, inexpensive, and readily available supplies.

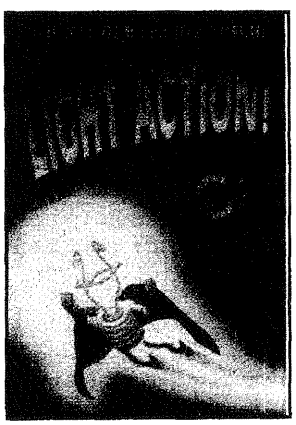
The book is divided into 11 chapters and covers subjects ranging from reflection and refraction to color, vision, waves, and polarization. Chapters begin with some basic background information and history, followed by a number of experiments. Each experiment is given a catchy title (*e.g.*, "Catch light on a silver tray"), followed by a list of materials and equipment, a clearly described procedure to guide young experimenters, and a section entitled "Here's what's happening" that explains the physics behind the observations. The authors have done a great job of providing simple explanations that are also technically accurate.

Turning the World Inside Out and 174 Other Simple Physics Demonstrations

Robert Ehrlich, Princeton University Press, Princeton, N.J., 1990, 216 pp. with index, $16.95. Out of print. ISBN 0-691-02395-6 QC33.E54 1990.

Ehrlich's book describes 175 simple demonstrations, at least 25 of which are specifically related to geometrical optics, polarization, interference, or diffraction. In fact, the title of the book comes from a geometrical optics experiment with a Christmas tree ornament. The demonstrations can all be done with inexpensive supplies. I'd say they're appropriate for ages 12 and up, although some of the explanations are geared toward a more advanced audience.

Experiments are laid out "cookbook" style, with a brief description of the experiment, an illustration, a



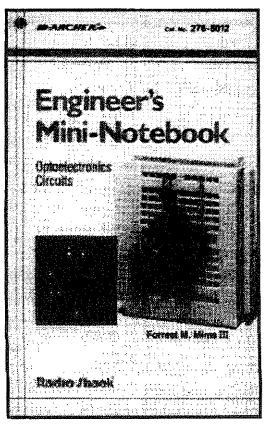
list of the necessary equipment, and a commentary discussing the relevant physical principles.

Seeing the Light: Optics in Nature, Photography, Color, Vision, and Holography

David Falk, Dieter Brill, and David Stork, John Wiley & Sons, New York, N.Y. 1986, 446 pp. with index, $70.95. ISBN 0-471-60385-6 QC358.F36 1985.

A short description can't do justice to this excellent book. It's an extensive tome, written at the level of *Scientific American.* The targeted readers are nonscientist, college students; nevertheless, the book has a surprising wealth of sophisticated detail. It includes a myriad of topics covering most of what we would call "optics"—everything from basic geometrical optics, color, and vision, to optical instruments, photography, physical optics, and holography. The book is non-mathematical, with the exception of some excellent appendices that require no more than basic trigonometry and algebra.

Scattered throughout the book are dozens of "Try It's." These are simple experiments that can be done at home using readily obtained, inexpensive supplies—experiments designed with the same spirit as those usually described here. If you regularly enjoy reading this column, you'll love this book. Check it out!



Engineer's Mini-Notebook: Optoelectronics Circuits

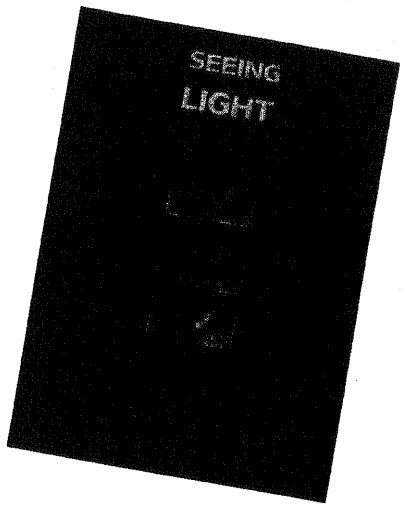
Forrest M. Mims III, Tandy Corp., Fort Worth, Tex., 1986, 48 pp., $1.99. Available at Radio Shack, catalog number 276-5012.

This is one of a series of delightful little books by Forrest Mims III printed exclusively for Radio Shack and sold in their stores nationwide. It has 48 pages of handwritten text printed on a grid background reminiscent of engineer's graph paper. It begins with a brief discussion of optical components, light sources, and spectra with an emphasis on easily obtained components such as LEDs, phototransistors, simple lenses, and fibers (many of which are available at Radio Shack). The book then describes many simple electronic circuits for sensitive light meters, LED flashers, light activated relays, optical communication links, etc. The emphasis is on electronics, but there is plenty of optics-related fun to be had. The books in this series are appropriate for older children (high-school age) who are comfortable with tools.

Optoelectronics, Fiber Optics, and Laser Cookbook: More than 150 Projects and Experiments

Thomas Petruzzellis, TAB books division of McGraw Hill, New York, N.Y., 1997, 332 pp. with index, $29.95. ISBN 0-07-049840-7 TK9965.P48 1997.

This is like a big daddy version of Forrest Mims' little book. It's geared toward the electronics hobbyist, but it has a healthy dose of optics thrown into the mix. The book begins with a chapter on light sources



and detectors (including LEDs, lasers, photoresistors, photovoltaic cells, and phototransistors). Next is a rudimentary primer on optics for the non-expert followed by a series of chapters describing optoelectronic circuits and projects. A big section of the text is devoted to projects involving optical sensors, and there are many projects involving light meters, light sensitive switch type circuits, and various burglar alarm systems.

Many of the projects either use or duplicate the function of off-the-shelf optoelectronic devices; this feature of the book makes it quite appealing to those of us who like to learn how various tidbits of technology work. There are far too many projects to list here (150), but some of the more interesting ones include a UV photometer, a laser seismometer, a flash slave trigger, a fiber-optic vibration detector, and an optical motion detector. Very little math or physics is assumed; the book is appropriate for high school students with a significant amount of electronics savvy.

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