



## Building Electro-Optical Systems Making It All Work

Philip C. D. Hobbs  
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REVIEWED BY TONY SIEGMAN

As graduate students and industrial researchers are well aware, it's not the scientific underpinnings or technical concepts that pose the most difficult problems in experimental research: the real headache is getting the plumbing and vacuum systems tight, the detectors and electronics working, the lasers and optics aligned and operating. An optics researcher's bookcase may hold theoretical volumes like Born and Wolf, Morse and Feshbach, and Abramowitz and Stegun, or its modern replacement, *The Mathematica Book*. The well-thumbed publications on the lab bench or optical table, however, will be more practical references like vendor catalogs, instrument manuals, and for laser researchers, perhaps Koechner's *Solid-State Laser Engineering*.

In my own long-ago graduate work on microwave electron tubes, Ramo and Whinnery's *Fields and Waves in Modern Radio* and John R. Pierce's *Traveling Wave Tubes* were secondary to the Hewlett Packard and General Radio instrument manuals, along with Walter Kohl's *Materials and Techniques for Electron Tubes*, or, as lasers came to the fore in the 1960s and 1970s, Wolfe's *Handbook of Military Infrared Technology* and RCA's *Phototubes and Photocells Technical Manual and Electro-Optics Handbook*. Stanford optics students today tell me that the older editions of the Melles-Griot catalog provide valuable information, although unfortunately this component has been trimmed back in the latest version.

Many university science departments, recognizing the real-world needs of their student researchers, offer a graduate course in experimental electronics, for which the scriptural authority can only be Horowitz and Hill's *The Art of Electronics*.

Now a new laboratory bible for optics researchers has joined the list: it is Phil Hobbs' *Building Electro-Optical Systems Making It All Work*, aimed at providing "accessible presentation of the practical lore of electro-optical instrument design and construction." I predict it will move to the front of the shelf.

This is a wonderfully practical book. As the author says in the opening sentence of the preface, "This is a book of lore... the book I needed as a graduate student." Lore means "rules of thumb, experience, bits of theory,

weakness. The final chapter, "Bringing up the system," covers debugging and troubleshooting, and offers some hard-won political advice for the working engineer on dealing with colleagues, vendors, bosses, and customers.

*Building Electro-Optical Systems Making It All Work* is also a wonderfully entertaining read. What other optics text has section headings like "Greedy Optimization," "Sleazy Approximations," "Avoiding Catastrophes," and "Do You Really Want to Do This?" Or index entries like "Ahab, Captain," "Fads," "Fata Morgana,"

**"You are fools to say you learn from your mistakes. I learn from the mistakes of other men."**

—Otto von Bismarck, as quoted in *Building Electro-Optical Systems*



and an indefinable feeling for the right way to do things... lore lives in the fingers more than the brain." The 19 chapters and 750 densely packed pages of Hobbs' book give wide-ranging practical advice on designing and using optical systems and optical elements of all kinds, sources and detectors, coatings and finishes, optical measurement instruments, fiber optics, lasers of all kinds, and an extensive discussion of electronic and opto-electronic building blocks, subsystems, construction techniques, and data processing techniques. Although concepts of layout, alignment, and mechanical design are not totally lacking, I would have preferred to see more information on opto-mechanical techniques: perhaps this is the book's only

"Hacks," "Pistol and shoehorn," and "War stories?" Or statements like, "All the riffraff of the frequency domain collects at base-band"?

The terms "nose grease" and "dead bug method" are not in the index—but they're in the book.

Each chapter is headed by an entertaining quote; these are taken from a wide variety of sources. The preface is headed with a quote from Otto von Bismarck: "You are fools to say you learn from your mistakes. I learn from the mistakes of other men." This book should help several generations of optics workers do exactly that.

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