book review

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Practical Holography, 3rd Edition, Graham Saxby, IOP, 482 pages, ISBN 0-7503-0912-1

About the author

Michael was born on an insignificant little blue-green planet orbiting an unregarded yellow sun out in the unfashionable backwaters of the western spiral arm of the galaxy and is a computer programmer currently working in the games industry. He has been interested in holography and has been making holograms since 1984, with a few long breaks for Real Life. He hopes to soon take over the world by combining his experience in 3D graphics with holography.

Introduction

The release of Graham Saxby's third edition of Practical Holography shows how well the author understands what people need from a complete book on holography. He takes the reader through what a hologram is, the history of holography, what sort of light sources can be used to make a hologram, what kinds have been made to date and so on through to making and displaying your own images.

The book is written in a clear and concise manner and is augmented by additional tips, definitions, and observations in the margins as well as extensive source references at the end of each chapter.

If you're new to the field or hobby of holography you should make this one of the first books you buy. Even if you're an old hand this book will probably show you a few new tricks.

Overview of the book

The first four chapters (What is a hologram, How holography began, Light sources for holography, The basic types of hologram) should be read through by anyone starting out in holography. You don't necessarily need to understand everything in those chapters right off, but by reading those basics you'll be better prepared to digest the rest of the book.

The first chapter explains what a hologram is, interference, diffraction, amplitude and phase gratings in a way that most interested readers will have no trouble understanding.

The book continues through the history of holography, the light sources used to make holograms, the basic types of holograms and describes the materials and processing used in making holograms.

It's in chapter six that Saxby begins explaining how the reader can make their first single-beam hologram using a gas or diode laser. This chapter

has complete details on all the equipment needed, how to set it up, shoot it, process the exposed film and view your finished hologram. If you are unfortunate enough to end up with a dim or non-existent image (which is likely to happen the first time) the author takes you through the steps needed to find out what happened and how to fix the problem.

Chapter seven then takes the reader through more advanced single-beam configurations and introduces a few new tools and methods such as using a spatial filter, index matching film and multi-exposure techniques.

The rest of the book shows a similar progression, taking the reader through more complicated steps such as making transfer holograms, building a holography lab, creating master and copy holograms, homemade optical elements and so on.

For those with a mathematical bent, the first three appendices contain information you'll want to read and digest after going through the first few chapters of the book. These appendices are clearly written and approachable even to those who aren't particularly adept at mathematics. Saxby also includes an appendix with worksheets for computing the geometries needed for several forms of multicolor holograms.

If you've been around the block a time or two (or at least ridden with someone else) you might think that this book would offer little new material. In fact, there is plenty of material for the more experienced holographer. The material ranges from information on fiber optics use, color holography, edge lit holograms and beyond. See the included table of contents from chapter 16 on.

Differences between this and the previous edition

Extensive side notes have been added which expand on and clarify the information given in the main text. These comments could have been left out and the book would not have suffered but by adding them the author gives information that enriches the main text.

The chapter on light sources used for holography has been expanded to include information on diode lasers as well as new information on DPSS (diode-pumped solid-state) and white light laser sources.

The pages devoted to copying holograms have been greatly expanded from one chapter with six pages to two chapters of nearly thirty pages. These cover several techniques for copying both transmission and reflection holograms and close by covering the relatively new technique of edge lighting holograms.

Natural color holography now has a full chapter devoted to it which starts by covering how we perceive color as well as details on how the eye responds to light of differing wavelengths. Details are then given on how individual primary colors are commonly combined to form colors that you

won't find in the natural spectrum. From there the author describes how lasers of differing color may be combined on the table to create a simulated full-color image. While this chapter won't give you all the details you need for natural color holography it will get you started and there are several references at the end of the chapter that can carry you further.

A chapter has been added covering non-silver processes for making holograms and even includes limited information on coating your own glass plates. This chapter starts out by mentioning the high sensitivity of silver-halide emulsions and discussing the major reasons for its use. Saxby moves on to the details of dichromated gelatin (DCG) use and outlines methods for mixing DCG, coating glass plates, exposure and processing. If you're interested in extremely bright holograms, this section will definitely whet your appetite for rolling your own plates. From there he moves on to brief discussions of SHSG, photopolymers, photothermoplastics and other processes. He doesn't go into the same detail in the later sections as he does for DCG but there are plenty of references at the end of the chapter.

Holographic stereograms now have an entire chapter devoted to them. This chapter includes instructions for making several different kinds of stereogram and details for creating good source material, usually photographs. The author even outlines some methods for computer control of a simple holoprinter as well as color control to obtain achromatic and full-color transfers.

A new chapter on the use of holography in biology and medicine includes information on hologram use for dental training, ophthalmology and stereogram use with PET and CAT scan data.

The appendix on processing formulas has been updated and expanded and now includes instruction on creating your own emulsion.

So, the book is perfect is it?

While there are a few typographical errors that the publisher is working to correct in future printings, there really isn't much that I could find fault with. A few relatively minor complaints are detailed below.

Interferometer testing isn't introduced until chapter 11 but making your first hologram begins in chapter 6. The reasoning behind this is likely twofold.

1. All the table setups prior to chapter 11 involve using a single beam for the reference and object light and there are less stringent stability requirements for single-beam setups.

2. Setting up an interferometer requires two mirrors, one beam splitter and one lens as well as mounts for all of those elements and Saxby makes an effort to minimize the equipment needed to get going.

Forcing the reader to buy additional optics needed only for the interferometer could be seen as an impediment to bringing people into the field. My only complaint with that reasoning (if that really is what determined where table testing was placed in the book) is that knowing your environment can be critical in understanding your failures when starting out in holography. You will have a few failures in the beginning, especially if you're not working in a dedicated laser lab. While single-beam setups are less sensitive to vibration problems, they aren't immune and testing your area with an interferometer can give you invaluable information about what limitations you start out with.

Not all film listed is still available (Kodak no longer makes plates) or available to the general public (most photopolymer material). This is not surprising as this is an area of the field that is in constant change. New materials are appearing as old materials are being refined or disappear completely. You'd be better served by doing an Internet search or checking in the Holography Forum (www.holographyforum.org) for the current state of the art.

My soft cover copy is only three months old and is already coming apart at the binding. This may be a problem with that particular run.

All three editions of Practical Holography have included a hologram of some kind. The first edition actually included two, an embossed hologram on the cover and a silver-halide hologram on the first page. Unfortunately the second and third editions have only included embossed holograms on the cover and while I'm sure that type was selected for the relatively low production cost, they are not the best examples of the art. The depth of field available with embossed holograms is severely limited and while they are visible in almost any light, embossed holograms lack the impressive sense of 3D available from simple reflection holograms on silver-halide or photopolymer.

Summary

I have no trouble at all in recommending the third edition of Practical Holography to everyone interested in holography. There's something for every holographer in this book.

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