

Shoebox Holography

A Step-by-Step Guide to Making Holograms Using
Inexpensive Semiconductor Diode Lasers

**By Frank DeFreitas, Alan Rhody
and Stephen W. Michael**

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Includes index

1. Holography—Handbooks, Manuals
2. Photography, Abstract—Handbooks, Manuals
3. Lasers, Semiconductor Diode—Experiments

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Foreword

Shoebox Holography fulfills a need that has existed since the discovery of holography: the desire for inexpensive, readily available materials and a simple methodology that will ensure the successful creation of a hologram.

When I began making holograms in 1970, there were no step-by-step practical guidelines, only textbooks and scientific papers filled with complex equations and generalized holography recording arrangements. My single beam reflection holograms were almost always successful, but my ultimate goal was to produce more sophisticated images. For most of the '70s, I was able to accomplish and perfect my goal by trial and error, learning unpublished secrets like correct polarization, path lengths, and beam intensity ratios.

In August 1996, I published my multibeam techniques on the Internet using step-by-step procedures so anyone could successfully make display holograms. My site was well received by amateur holographers. But the cost of building my holography recording system was still out of reach for most people. In early 1998, I started receiving emails from people wanting to know if a hologram could be made using a laser pointer. I honestly didn't know and said so. I had heard through the grapevine that it couldn't be done, because a pointer had inadequate coherence and polarization. I decided to find out for myself. I bought a laser pointer and found myself once again working with single beam holograms. I tested the laser's coherence and polarization and found them to be very adequate. I set up a single beam reflection arrangement and successfully produced a high quality hologram on a 4" x 5" plate. The cost of a laser for creating holograms had just been reduced to less than \$20, removing an expensive part of hologram creation.

My single beam results were confirmed by Frank DeFreitas, using a different laser pointer bought for less than \$10. Frank went on to create his *Shoebox Holography* booklet, meeting the need for an inexpensive and successful methodology for creating quality display holograms for the beginning holographer. There is definitely a moral to this story: sometimes you just have to find out things for yourself.

Stephen W. Michael, Holographer

Preface

This book is a do-it-yourself, step-by-step guide to building a hologram recording system with a minimum of expense and space. By following the instructions in this book you can produce three dimensional holographic images in your own home or classroom. Because all the needed components can be packed into a small box, I call my production method "shoebox holography."

Lasers are needed to make holograms. Until recently, a suitable laser cost hundreds or thousands of dollars. The Shoebox Holography system is based on inexpensive, low-power semiconductor diode lasers. This type of laser can be found in CD and DVD players, supermarket scanners and even in ordinary laser pointers. It's hard to believe a laser suitable for basic holography can now be purchased for less than \$10!

As far as I know, Stephen Michael of Three Dimensional Imagery was the first person to successfully produce visually striking holographic images using the laser in an inexpensive pointer. Within a few days of his December 1998 experiments, I confirmed Steve's results. Since that time, we have created an entirely new way of making various types of holograms using these semiconductor diode lasers. This book will teach you one of the production methods we developed.

Besides a laser, you will need to collect an assortment of other easily obtainable items. Most of them are available at your local hardware or electronics store. Depending on where you are located a few may have to be ordered from suppliers listed in this book.

To close this introduction, I would like to tell you about Brittany and Samantha. The girls wanted to make holograms for their metro science competition using the Shoebox Holography system. Their science teacher told the girls' parents it couldn't be done. So their parents brought the girls to my studio, where they learned more about the process. Then they set up a Shoebox Holography system at home.

On Sunday, March 7, 1999, Brittany and Samantha took first place in their metro science competition for creating a hologram using a semiconductor laser. Brittany and Samantha are in the sixth grade.

Frank DeFreitas, Holography Instructor