PROGRESS IN OPTICS

VOLUME XXV

EDITED BY

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North-Holland is pleased to announce the publication of the 25th Volume in the series *Progress in Optics*, edited by Emil Wolf. In his preface to Volume I in 1960 the editor expressed the hope that the series will give help and provide stimulus to workers in Optics and in related sciences. This hope has certainly been realised in each one of the volumes published over the past 28 years.

The commemoration of the publication of the 25th volume indicates an important milestone in the progress and importance of this series, which will undoubtedly continue to provide an indispensable source of information and incentive to workers in the field for many years to come. The next volume is already in production, and many more titles are scheduled for future production.

It is a considerable honour for North-Holland to act as publisher for *Progress in Optics*. We would like to thank Emil Wolf for his continuous hard work and dedication to the series, as well as all the authors who have contributed in the past, and those who will do so in the future.

The Publisher

COVER ILLUSTRATIONS

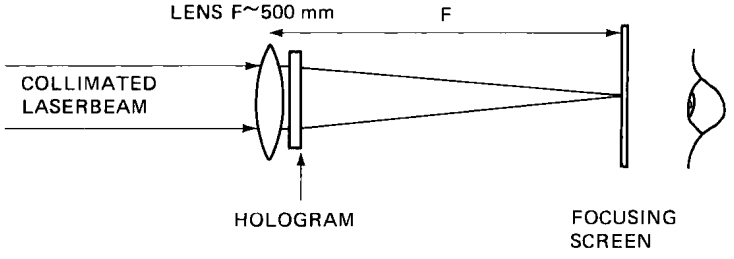
W. Stork, Physikalisches Institut der Universitat Erlangen-Nürnberg, FRG

The cover shows two computer-generated holograms, with their reconstructed images on the front and back flaps.

The holograms are Lohmann type III Fourier holograms. In these the amplitude of a pixel is encoded as the height of a rectangle in an elementary cell of twice the width of the rectangle. We "use" only the amplitudes of the pixels when we look at the pictures, so we may manipulate their phases (encoded as the lateral position of the rectangle in the cell) for other purposes.

For the holograms on the cover we calculated a special phase distribution which matches one amplitude distribution to the other, so that the holograms mutually reconstruct each other. [The algorithm for this calculation was first suggested by J.R. Fienup, Opt. Eng. 19 (1980) 297.]

The holograms were printed on a conventional laserprinter with a resolution of 300 dpi. If you want to see the real reconstructions of the holograms, record a positive slide of the printed hologram on a fine-grained film and use the set-up shown below.



PREFACE

This volume contains four review articles covering very different areas of optics. The first article deals with a topic of broad interest to the laser physics and laser engineering community, namely dynamical instabilities in active optical media and pulsations in the laser output. This is a very active field of current research, as can be surmised from the fact that this article occupies almost half of the present volume.

The second article is devoted to semiconductor lasers. Because of their small size, low power requirement and fast response, these devices are finding many useful scientific and industrial applications. The article deals mainly with their noise characteristics, techniques of noise reduction and with their temporal coherence properties.

The article that follows concerns somewhat unconventional optical devices, namely arrays of elements such as corner cube reflectors or fibers, for example. Because optical arrays form images by synthesis rather than by direct focusing such systems cannot be analyzed by means of the usual techniques of instrumental optics. The article reviews the theoretical tools that are being used in designing optical arrays and for analyzing their performance.

The last article deals with optics of aspheric (i.e. non-spherical) surfaces. It presents a broad survey of this field and also discusses some applications.

EMIL WOLF

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December 1987

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I

DYNAMICAL INSTABILITIES AND PULSATIONS IN LASERS

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