

# Optical Switching in Low-Dimensional Systems

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# Optical Switching in Low-Dimensional Systems

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Plenum Press

New York and London

Published in cooperation with NATO Scientific Affairs Division

Proceedings of a NATO Advanced Research Workshop  
on Optical Switching in Low-Dimensional Systems,  
held October 6–8, 1988,  
in Marbella, Spain

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Library of Congress Cataloging in Publication Data

NATO Advanced Research Workshop on Optical Switching in Low-Dimensional Systems (1988: Marbella, Spain)

Optical switching in low-dimensional systems / edited by H. Haug and L. Bányai.

p. cm.—(NATO ASI series. Series B, Physics; v. 194)

“Published in cooperation with NATO Scientific Affairs Division.”

Includes bibliographies and index.

ISBN-13: 978-1-4684-7280-6

e-ISBN-13: 978-1-4684-7278-3

DOI: 10.1007/978-1-4684-7278-3

1. Semiconductors—Optical properties—Congresses. 2. Quantum wells—Congresses. 3. Exciton theory—Congresses. 4. Electrooptics—Congresses. I. Haug, Hartmut. II. Bányai L. (Ladislaus) III. North Atlantic Treaty Organization. Scientific Affairs Division. IV. Title. V. Series.

QC611.6.06N38 1988

621.3815'2—dc19

89-3748

CIP

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© 1989 Plenum Press, New York

Softcover reprint of the hardcover 1st edition 1989

A Division of Plenum Publishing Corporation

233 Spring Street, New York, N.Y. 10013

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# **SPECIAL PROGRAM ON CONDENSED SYSTEMS OF LOW DIMENSIONALITY**

This book contains the proceedings of a NATO Advanced Research Workshop held within the program of activities of the NATO Special Program on Condensed Systems of Low Dimensionality, running from 1983 to 1988 as part of the activities of the NATO Science Committee.

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## **PREFACE**

This book contains all the papers presented at the NATO workshop on "Optical Switching in Low Dimensional Systems" held in Marbella, Spain from October 6th to 8th, 1988. Optical switching is a basic function for optical data processing, which is of technological interest because of its potential parallelism and its potential speed.

Semiconductors which exhibit resonance enhanced optical nonlinearities in the frequency range close to the band edge are the most intensively studied materials for optical bistability and fast gate operation. Modern crystal growth techniques, particularly molecular beam epitaxy, allow the manufacture of semiconductor microstructures such as quantum wells, quantum wires and quantum dots in which the electrons are only free to move in two, one or zero dimensions, respectively. The spatial confinement of the optically excited electron-hole pairs in these low dimensional structures gives rise to an enhancement of the excitonic nonlinearities. Furthermore, the variations of the microstructure extensions, of the compositions, and of the doping offer great new flexibility in engineering the desired optical properties.

Recently, organic chain molecules (such as polydiacetylene) which are different realizations of one dimensional electronic systems, have been shown also to have interesting optical nonlinearities.

Both the development and study of optical and electro-optical devices, as well as experimental and theoretical investigations of the underlying optical nonlinearities, are contained in this book.

We, the organizers of the NATO workshop, thank all our colleagues for their excellent contributions both to the meeting and to this book. The generous financial support of the NATO Scientific Affairs Division is gratefully acknowledged.

Hartmut Haug and Ladislaus Bányai

Frankfurt, October 1988

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