PROCEEDINGS OF SPIE

Complex Light and Optical Forces III

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Editors

28–29 January 2009
San Jose, California, United States

Sponsored and Published by
SPIE

Volume 7227

Proceedings of SPIE, 0277-786X, v. 7227

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Please use the following format to cite material from this book:
Author(s), "Title of Paper," in *Complex Light and Optical Forces III*, edited by Enrique J. Galvez, David L. Andrews, Jesper Glückstad, Proceedings of SPIE Vol. 7227 (SPIE, Bellingham, WA, 2009) Article CID Number.

ISSN 0277-786X
ISBN 9780819474735

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

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Introduction

The intrinsic properties of light beams with structured wavefronts, and in particular, the generation of these beams and their use for manipulating objects at the micro- and nano-scale level is a topic of intense research today, as exhibited by the presentations at the second conference on Complex Light and Optical Forces III, and the corresponding articles contained in this volume. Together with complex light beams comes the presence of optical singularities, whose properties and applications are rich and under ongoing study.

The presentations at the conference touched on various forms of optical singularities: shear singularities, polarization singularities, and the ubiquitous optical vortices. Presentations reported on the generation of optical beams with singularities, the propagation and evolution of singularities in either in free space or in optical media, the diffraction of singular beams off optical structures, the generation of new types of singular beams, and the stability of modes in asymmetric rotating optical cavities.

The conference highlighted the strong mix of fundamentals and applications. It included the latest advances in the use of light to exert forces and torques on individual atoms or molecules and macroscopic objects via optical tweezers. Some talks focused on the fundamentals and methods of manipulating objects with the phase gradients in the optical field. Rapid advances in the field have yielded exquisite control over trapped micron sized objects opening them up as useful tools for biological applications. The presentations also included the effect of the trapping forces on the reproductive behavior of living cells.

The conference ended with a session on the increasing entry of singular beams into quantum mechanical systems and their use in fundamental tests of quantum mechanics and in applications in quantum information. The role of optical forces in quantum systems such as Bose-Einstein condensates and their interactions with singular beams was underscored.

In summary, Complex Light and Optical Forces III was successful in underscoring the recent advances in a growing field that promises new fundamental contributions to optics and important photonic applications.

Enrique J. Galvez
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