

PROCEEDINGS OF SPIE

Complex Light and Optical Forces IV

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Editors

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Introduction

The present volume contains the proceedings of Complex Light and Optical Forces IV. This conference was the largest of our sequence, featuring 29 presentations. As is typical for these conference series the presentations consisted of an interesting variety of problems, all revolving around the common theme of complex light and fundamental issues related to manipulation with light.

The articles in these proceedings are representative of the presentations. They highlight important developments in the field with presentations in the generation and characterization of new light forms: hollow beams generated by etched fibers (Viswanathan et al.); hybrid vector beams generated by spun fibers (Milione et al.); non-diffracting beams (Ahluwalia and Lee); singular field patterns by passage through carbon nanotubes (Ponevchinsky et al.); new modes carrying vortex arrays (Chu and Otsuka), and Lissajous modes (Lu et al.) generated by open-frame laser cavities; helical beams in both amplitude and phase via spatial light modulators (Daria et al.); the propagation features of Airy beams (Sztul et al.); new methods of mode transformations (Sridhar et al.); orbital modes of few-cycle light pulses (Richter et al.); and noise reduction in imaging (Su et al.). At the heart of many of these light forms were optical singularities and their propagation through optical media (Milione et al.) and their dynamics via the creation and annihilation of singularities (Vasilev and Soskin), and the observation of new polarization singularities (Soskin and Polanskii).

We devoted a session to geometric phase, a ubiquitous feature of optical beam propagation, that appear in the space of trajectories (Viswanathan and Inavalli), the space of states of polarization (van Dijk et al.) and the space of high-order spatial modes (Habraken and Nienhuis). A session on quantum effects highlighted the increasing relevance of complex light in fundamental tests of quantum mechanics and quantum imaging (Leach et al., Galvez et al.).

The conference had important discussions about manipulation with light and optical forces, highlighted by presentations on optical binding from both theoretical (Andrews and Romero, Romero and Andrews) and experimental (Taylor and Love) perspectives. New developments in manipulation were presented: transfection and sorting of biological species with light (Ertmer et al.); optical guiding with waveguides (Ahluwalia et al.); optical trapping electrophoresis (Beunis et al.); manipulation with nonconservative forces in optical tweezers (Sun et al.); and particle tracking in optical tweezers (Eggert et al.).

In summary, these proceedings give a glimpse of the richness of breadth and depth in studies involving new complex light forms and innovative ways to exert optical forces.

**Enrique J. Galvez
David. L. Andrews
Jesper Glückstad**

