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Call for Papers

Complex Light and Optical Forces VII (OE120)

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Complex Light, or light with structured wavefronts, amplitudes and phases, is a common thread that binds a number of fundamental and applied areas of research in optics. On the fundamental side, these topics include classical and quantum aspects of the spin and orbital angular momentum of light, optical beams in high-order modes and ways to generate them, optical waves with singularities of phase and polarization, monochromatic and multichromatic vortices, vortex loops and knots, novel propagation dynamics, the interaction of singularities, new topological effects of multidimensional mode spaces, and the interactions of complex light with rotating optical elements and laser cavities. These fundamental studies also link significantly into other fields of intense study today, such as optical trapping, microrheology and cold atoms. Increasing interest in quantum information has led to multimode encoding of quantum information, quantum imaging and the use of orbital-angular-momentum quantum eigenstates for quantum computing, and new fundamental tests of quantum mechanics.

The complex light fields that can now be produced offer an unprecedented wealth of ways in which to probe and to exert forces on matter at the microscale and nanoscale level. The applied topics of this conference include the study of novel ways to manipulate matter with optical fields, and to organize, bind, channel or sort microscale or nanoscale objects. The applications of optical forces on matter generally engage light fields with special structures. Optical tweezers today offer exquisite control over microscopic objects using methods that are based on intensity and phase differentials. They are also used to generate beams with vortices, singularities and other kinds of phase structures; hollow beams; tailor-made three-dimensional optical traps; sheets of light; curved focus beams and evanescent waves. The optical elements associated with the production and detection of such beam structures themselves have significant imaging applications. This conference provides a forum for the development of new forms and methods of generating complex optical structures including optical traps and forces via passive or active diffractive elements. Through the exchange of linear or angular momentum between light and matter, optical force fields and torques can be produced with no conventional counterpart.

Many of these methods offer new opportunities for implementation in ultrahigh resolution imaging, nanoscale probes, optical tools in biotechnology, nanofabrication and photonics, laser cooling, atom trapping (optical molasses), atom chips, particle sorting and quantum information. Together, these topics represent a highly active interdisciplinary field with a rich scope for new developments, notably spanning both fundamental and applied aspects. The world-wide interest in these topics brings together an international community to discuss new fundamentals, methods and applications of complex light and optical forces.

Papers on all such areas are solicited, focusing on any of the following or related topics:

- singular optics and phase or polarization discontinuities
- optical vortices and their interactions
- optical angular momentum

- geometric phases
- spiral phase contrast and vortex filters
- polarization management
- structured beams: Laguerre-Gauss, Hermite-Gauss, Bessel, Mathieu, Airy, Helico-Conical
- pulsed structured beams, Bessel-X pulses
- optical tweezers and holographic optical trapping and manipulation
- optical binding
- optical manipulation using generalized phase contrast (GPC)
- optical robotics
- laser cooling, atom trapping and atom chips
- tractor beams and vector beams
- single photon spin transfer
- single-molecule interactions
- quantum multimode spaces, quantum information and imaging
- entanglement and hyperentanglement with spatial modes
- micro- and nanofabrication with structured light
- nano-optics and nanostructure devices
- optofluidics, optical sorting, optical fractionation
- chirality in nanoscale particles and films
- near-field and evanescent wave interactions
- ultrahigh resolution imaging.