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EDITORIAL

Nonlinear optical manipulation, patterning and control in nano- and micro-scale systems

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Guest Editors

Nonlinearities are becoming more and more important for a variety of applications in nanosciences, bio-medical sciences, information processing and photonics. For applications at the crossings of these fields, especially microscopic and nanoscopic imaging and manipulation, nonlinearities play a key role. They may range from simple nonlinear parameter changes up to applications in manipulating, controlling and structuring material by light, or the manipulation of light by light itself.

It is this area between basic nonlinear optics and photonic applications that includes 'hot' topics such as ultra-resolution optical microscopy, micro- and nanomanipulation and -structuring, or nanophotonics. This special issue contains contributions in this field, many of them from the International Conference on Nonlinear Microscopy and Optical Control held in conjunction with a network meeting of the ESF COST action MP0604 'Optical Micromanipulation by Nonlinear Nanophotonics', 19–22 February 2008, Münster, Germany.

Throughout this special issue, basic investigations of material structuring by nonlinear light–matter interaction, light-induced control of nanoparticles, and novel nonlinear material investigation techniques, are presented, covering the basic field of optical manipulation and control. These papers are followed by impressive developments of optical tweezers. Nowadays, optical phase contrast tweezers, twin and especially multiple beam traps, develop particle control in a new dimension: particles can be arranged, sorted and identified with high throughput. One of the most prominent forthcoming applications of optical tweezers is in the field of microfluidics. The action of light on fluids will open new horizons in microfluidic manipulation and control.

The field of optical manipulation and control is a very broad field that has developed in an impressive way, in a short time, in Europe with the installation of the MP0604 network. Top researchers from 19 countries are collaborating in this network. The editors are grateful for the active participation of all colleagues in this network, in the network meeting, and in making this special issue a success.

We also extend our thanks to a great *Journal of Optics A* staff that have supported the editing of this special issue, especially the Publishing Editor, Julia Dickinson.

Among the active colleagues in our network was also Associate Professor Erik Fällman, Umea University, Sweden. It was with great sadness that we learnt of the death of our colleague and friend in June 2008. We dedicate this special issue to his memory, and the active and always engaged contribution he made both to our conference and to the field of optical micromanipulation and optical control. Erik will be particularly remembered for his applications of optical force measurements on bacterial pili adhesion, which has stimulated a worldwide experimental and theoretical interest in this field.

