

# Conference 5930 • Conv. Ctr. Room 6C

Sunday-Thursday 31 July-4 August 2005 • Proceedings of SPIE Vol. 5930

## Optical Trapping and Optical Micromanipulation II

Conference Chairs: **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom); **Gabriel C. Spalding**, Illinois Wesleyan Univ.

Program Committee: **Clemens Bechinger**, Univ. Stuttgart (Germany); **Kirstine Berg-Sørensen**, Univ. of Copenhagen (Denmark); **Min Gu**, Swinburne Univ. of Technology (Australia); **Jochen R. Guck**, Univ. Leipzig (Germany); **David W. Marr**, Colorado School of Mines; **Jens-Christian D. Meiners**, Univ. of Michigan; **Alexander Rohrbach**, European Molecular Biology Lab. (Germany); **Alfons van Blaaderen**, Univ. Utrecht (Netherlands); **Pavel Zemánek**, Institute of Scientific Instruments (Czech Republic)

### Sunday 31 July

#### SESSION 1

Conv. Ctr. Room 6C ..... Sun. 2:00 to 3:00 pm

#### Keynote Session

Chairs: **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom); **Gabriel C. Spalding**, Illinois Wesleyan Univ.

#### Keynote

2:00 pm: **Optical tweezers: biophysics, one molecule at a time (Invited Paper)**, S. M. Block, Stanford Univ. .... [5930-01]

#### Conference Social Hour

Attendees of the conference on Optical Trapping and Optical Micromanipulation are invited to meet and greet their colleagues during this special social hour.

#### Symposium-Wide Plenary Presentation

Sunday 31 July 2005 ..... 5:00 to 5:45 pm

#### Productive Nanosystems: Roadmap to a bottom-up revolution

**Dr. K. Eric Drexler**, founder, Foresight Institute

See p. 16 for presentation overview.

### Monday 1 August

#### Nanotechnology Plenary Session

Monday ..... 8:30 am to 12:05 pm

Chair: **James G. Grote**, Air Force Research Lab.

Nanophotonics and biomedical applications, Paras N. Prasad, Univ. at Buffalo

Quantum dot optoelectronic devices, Chennupati Jagadish, The Australian National Univ. (Australia)

Design and engineering of nanoparticles, Mamoun Muhammed, Kungliga Tekniska högskolan (Sweden)

First principles design of nanostructured, electro-optic organic glasses, Prof. Larry Dalton, Univ. of Washington

Nanotechnology in the Air Force Research Laboratory, Barry Farmer, Air Force Research Lab.

The overlap of bio- and nano-technologies: the tie to photonics and DoD interest, Morely Stone, DARPA Defense Sciences Office

See p. 16 for additional information.

#### SESSION 2

Conv. Ctr. Room 6C ..... Mon. 1:30 to 3:30 pm

#### Bio I

Chair: **Kirstine Berg-Sørensen**, Univ. of Copenhagen (Denmark)

1:30 pm: **Laser scissors in space and time (Invited Paper)**, M. W. Berns, Beckman Laser Institute and Univ. of California/San Diego; E. L. Botvinick, Beckman Laser Institute and Univ. of California/Irvine; V. Venugopalan, Univ. of California/Irvine and Beckman Laser Institute ..... [5930-02]

2:00 pm: **Optical trapping inside living organisms (Invited Paper)**, L. B. Oddershede, P. M. Hansen, Univ. of Copenhagen (Denmark) ..... [5930-03]

2:30 pm: **Oscillating optical tweezer-based 3D confocal microrheometer for investigating the intracellular micromechanics and structures**, H. D. Ou-Yang, M. Mengistu, A. Kumar, C. Pu, L. Lowe-Krentz, Lehigh Univ. .... [5930-04]

2:50 pm: **Trapping and tracking in the presence of phase disturbances**, A. Rohrbach, P. C. Seitz, E. H. Stelzer, European Molecular Biology Lab. (Germany) ..... [5930-05]

3:10 pm: **Phagocytic cell membrane mechanics probed by photonic force microscopy**, H. Kress, E. H. Stelzer, G. Griffiths, A. Rohrbach, European Molecular Biology Lab. (Germany) ..... [5930-06]

Coffee Break ..... 3:30 to 4:00 pm

#### SESSION 3

Conv. Ctr. Room 6C ..... Mon. 4:00 to 5:40 pm

#### Spectroscopy in Traps

Chair: **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom)

4:00 pm: **Microspectroscopy and scanning microscopy in an optical tweezers system**, A. Fontes, A. de Thomaz, A. Neves, W. Moreira, L. C. Barbosa, Univ. Estadual de Campinas (Brazil); P. de Farias, B. Santos, R. Ferreira, Univ. Federal de Pernambuco (Brazil); A. de Paula, Univ. of Southampton (United Kingdom); K. Ajito, Nippon Telegraph and Telephone Corp. (Japan); C. L. Cesar, Univ. Estadual de Campinas (Brazil) ..... [5930-75]

4:20 pm: **Raman spectroscopy of a single living cell in environmentally stress conditions**, G. Singh, C. Creely, G. Volpe, Institut de Ciències Fotòniques (Spain); H. Grottsch, Institut de Biologia Molecular de Barcelona (Spain); D. Petrov, Institut de Ciències Fotòniques (Spain) ..... [5930-08]

4:40 pm: **Raman tweezers spectroscopy perpendicularly decoupled from probe laser via fibre optical trapping**, P. R. Jess, V. G. Garcés-Chávez, K. Dholakia, Univ. of St. Andrews (United Kingdom) ..... [5930-09]

5:00 pm: **Multiple optical tweezers for micro Raman spectroscopy**, D. A. Cojoc, Istituto Nazionale per la Fisica della Materia (Italy) and Univ. Politehnica Bucuresti (Romania); E. Ferrari, V. Garbin, E. M. Di Fabrizio, Istituto Nazionale per la Fisica della Materia (Italy) ..... [5930-10]

5:20 pm: **Force spectroscopy and two photon excited luminescence in an optical tweezers system**, A. Fontes, A. Neves, W. Moreira, A. de Thomaz, L. C. Barbosa, Univ. Estadual de Campinas (Brazil); A. de Paula, Univ. of Southampton (Brazil); K. Ajito, Nippon Telegraph and Telephone Corp. (Japan); C. L. Cesar, Univ. Estadual de Campinas (Brazil) ..... [5930-11]

#### ✓ Posters-Monday

Poster authors will begin displaying posters after 10:00 am Monday morning in Conv. Ctr. Exhibition Hall B2. A poster reception, with authors present at their posters, will be held Monday evening from 6:00 to 7:30 pm. Light refreshments will be served. Poster authors, see page 272 for setup instructions.

✓ **Studying the function of phagocytosis from the rat THP-1 by using optical tweezers**, Y. Su, L. Hsu, National Chiao-Tung Univ. (Taiwan) ..... [5930-58]

✓ **Mechanical properties of stored red blood cells using optical tweezers**, A. Fontes, A. de Thomaz, L. Pozzo, M. Barjas-Castro, S. Saad, M. Brandao, L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) ..... [5930-59]

✓ **Using optical tweezers to examine the chemotactic force to a single inflammatory cell: neutrophil stimulated by a chemoattractant from bacteria**, P. Shih, Y. Su, National Chiao Tung Univ. (Taiwan); L. Jen, Chung Shan Medical Univ. (Taiwan); Y. Tsai, L. Hsu, National Chiao Tung Univ. (Taiwan); C. Liu, Chung Shan Medical Univ. (Taiwan) ..... [5930-60]

✓ **Trapping with local evanescent light fields**, R. Quidant, A. Zelenina, Institut de Ciències Fotòniques (Spain); D. Petrov, G. Badenes, Institut de Ciències Fotòniques; M. Nieto-Vesperinas, Consejo Superior de Investigaciones Científicas ..... [5930-61]

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- ✓ **Optical trapping in rarefied media: towards laser-trapped space telescopes**, M. Guillon, Univ. de Provence (France); A. Labeyrie, Collège de France (France); J. R. Fournier, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . [5930-62]
- ✓ **Observation of the angular momentum transfer in the Mie regime using novel beams**, C. Lopez-Mariscal, Tecnológico de Monterrey (Mexico); V. G. Garcés-Chávez, Univ. of St. Andrews (United Kingdom); J. C. Gutierrez-Vega, Tecnológico de Monterrey (Mexico); K. Dholakia, Univ. of St. Andrews (United Kingdom) . . . . . [5930-63]
- ✓ **The study of cell-sorting by using microfluidics and holographic optical tweezers**, H. Lin, S. Tseng, L. Hsu, National Chiao Tung Univ. (Taiwan) . . . . . [5930-64]
- ✓ **Generation of spiral optical beams using a spatial light modulator**, P. J. L. Rodrigo, J. Glückstad, Risø National Lab. (Denmark); C. A. Alonzo, Univ. of the Philippines (Philippines) . . . . . [5930-65]
- ✓ **Manipulation of single and multiple low-index particles by means of optical tweezers**, V. Garbin, Istituto Nazionale per la Fisica della Materia (Italy) and Univ. degli Studi di Trieste (Italy); D. A. Cojoc, Istituto Nazionale per la Fisica della Materia (Italy) and Univ. Politecnica Bucuresti (Romania); R. N. Kulkarni, International Institute of Information Technology (India); E. Ferrari, Istituto Nazionale per la Fisica della Materia (Italy) and Univ. degli Studi di Trieste (Italy); E. M. Di Fabrizio, Istituto Nazionale per la Fisica della Materia (Italy) . . . [5930-66]
- ✓ **Fast hologram computation and aberration control for holographic tweezers**, M. Reicherter, S. Zwick, T. Haist, W. Osten, Univ. Stuttgart (Germany) . . . . [5930-67]
- ✓ **Grasping microscopic objects by an optical trapping system controlled by five finger tips**, I. Park, S. Hwang, O. H. Ahn, J. Song, Y. Lee, Gwangju Institute of Science and Technology (South Korea) . . . . . [5930-68]
- ✓ **Laser beam manipulation of particles using dynamic holograms**, T. Iwai, M. Shirai, Hokkaido Univ. (Japan) . . . . . [5930-69]
- ✓ **Mathematical model of a DIC position sensing system within an optical trap**, K. D. Wulff, D. G. Cole, R. L. Clark, Jr., Duke Univ. . . . . [5930-71]
- ✓ **MatLab package with graphical user interface for efficient and precise calibration of optical tweezers**, P. M. Hansen, Univ. of Copenhagen (Denmark); I. M. Tolic-Nørrellykke, Max Planck Institute of Molecular Cell Biology and Genetic Dresden (Germany); H. K. Flyvbjerg, Risø National Lab. (Denmark); K. Berg-Sørensen, Univ. of Copenhagen (Denmark) . . . . . [5930-72]
- ✓ **Characterization of optical traps using on-line estimation methods**, J. J. Gorman, T. W. LeBrun, A. Balijepalli, C. Gagnon, D. Lee, National Institute of Standards and Technology . . . . . [5930-73]

## Tuesday 2 August

### SESSION 4

Conv. Ctr. Room 6C . . . . . Tues. 8:00 to 10:00 am

#### Bio II

- Chair: Alexander Rohrbach, European Molecular Biology Lab. (Germany)*
- 8:00 am: **Axicon-based annular laser trap for sperm activity and chemotaxis study**, B. Shao, J. M. Vinson, E. Botvinik, S. C. Esener, M. W. Berns, Univ. of California/San Diego . . . . . [5930-12]
  - 8:20 am: **Analysis of the swimming activity of pseudomonas aeruginosa by using photonic force microscope**, C. Chan, B. Chang, Y. Huang, C. Fan, Y. Kuo, L. Hsu, H. Peng, National Chiao Tung Univ. (Taiwan); H. Chang, National Tsing Hua Univ. (Taiwan); Y. Lai, National Chiao Tung Univ. (Taiwan); S. Chi, Yuan Ze Univ. (Taiwan) . . . . . [5930-13]
  - 8:40 am: **Measuring fungal forces with optical tweezers**, G. D. Wright, L. Wilson, J. Arlt, W. C. Poon, N. D. Read, Univ. of Edinburgh (United Kingdom) . . . . . [5930-14]
  - 9:00 am: **Laser tweezers in the study of cellular mechanotransduction with a fluorescence resonance energy transfer based Src biosensor**, E. L. Botvinick, Univ. of California/Irvine and Univ. of California/San Diego; Y. Wang, Univ. of California/San Diego; M. W. Berns, Univ. of California/Irvine and Univ. of California/San Diego; S. Chien, Univ. of California/San Diego . . . . . [5930-15]
  - 9:20 am: **Ultra-high speed observations of optically trapped micro-bubble dynamics: the mechanism of sonoporation**, P. A. Prentice, Univ. of Dundee (United Kingdom); M. P. Macdonald, K. Dholakia, Univ. of St. Andrews (United Kingdom); P. Campbell, Univ. of Dundee (United Kingdom) . . . . . [5930-16]
  - 9:40 am: **Hydrodynamics of bacterial suspensions**, J. Arlt, W. J. Duncan, W. C. Poon, Univ. of Edinburgh (United Kingdom) . . . . . [5930-78]
  - Coffee Break . . . . . 10:00 to 10:30 am

### SESSION 5

Conv. Ctr. Room 6C . . . . . Tues. 10:30 am to 12:00 pm

#### Basic Science I

- Chair: Pavel Zemánek, Institute of Scientific Instruments (Czech Republic)*
- 10:30 am: **Experimental demonstrations of the Fluctuation Theorem in a viscoelastic solvent using a colloidal particle held in an optical trap (Invited Paper)**, D. M. Carberry, M. A. Baker, G. Wang, E. M. Sevick, D. J. Evans, Australian National Univ. (Australia) . . . . . [5930-18]
  - 11:00 am: **Optical manipulation of matter-waves**, R. Carretero, San Diego State Univ.; P. G. Kevrekidis, Univ. of Massachusetts/Amherst; D. J. Frantzeskakis, Univ. of Athens (Greece); B. A. Malomed, Tel Aviv Univ. (Israel) . . . . . [5930-19]
  - 11:20 am: **Optically bound arrays in a fiber trap**, N. K. Metzger, K. Dholakia, Univ. of St Andrews (United Kingdom); E. M. Wright, The Univ. of Arizona . . . . . [5930-20]
  - 11:40 am: **Mapping of three-dimensional optical force field on a micro-particle confined in a counter-propagating dual-beam trap via light scattered along two orthogonal directions**, K. Yang, M. Wei, A. V. Karmenyan, H. Chen, A. E. T. Chiou, National Yang-Ming Univ. (Taiwan) . . . . . [5930-21]
  - Lunch/Exhibition Break . . . . . 12:00 to 2:00 pm

### SESSION 6

Conv. Ctr. Room 6C . . . . . Tues. 2:00 to 3:00 pm

#### Basic Science II

- Chair: Pavel Zemánek, Institute of Scientific Instruments (Czech Republic)*
- 2:00 pm: **Radiation pressure and the distribution of electromagnetic force in dielectric media (Invited Paper)**, M. Mansuripur, A. R. Zakharian, J. V. Moloney, The Univ. of Arizona . . . . . [5930-22]
  - 2:30 pm: **Opto-hydrodynamic instability of fluid interfaces (Invited Paper)**, J. Delville, B. Isenmann, R. Wunenburger, Univ. Bordeaux 1 (France); A. Casner, CEA DAM Ile de France (France) . . . . . [5930-23]
  - Coffee Break . . . . . 3:00 to 3:30 pm

### SESSION 7

Conv. Ctr. Room 6C . . . . . Tues. 3:30 to 5:20 pm

#### Near Field / Nano Traps I

- Chair: Veneranda G. Garcés-Chávez, Univ. of St. Andrews (United Kingdom)*
- 3:30 pm: **Near field optical tweezers (Invited Paper)**, S. Kuriakose, M. Gu, X. Gan, J. W. M. Chon, Swinburne Univ. of Technology (Australia) . . . . . [5930-24]
  - 4:00 pm: **Sub-micron-particle delivery using evanescent field**, M. Seřy, T. Cizmar, P. Ják, M. Šiller, P. Zemánek, Institute of Scientific Instruments (Czech Republic) . . . . . [5930-25]
  - 4:20 pm: **Trapping and manipulating individual molecules in solution**, A. E. Cohen, W. E. Moerner, Stanford Univ. . . . . [5930-26]
  - 4:40 pm: **Second harmonic generation from silver nanoparticles and their aggregates trapped by a near-infrared laser beam**, H. Yoshikawa, Osaka Univ. (Japan); T. Itoh, Kwansai Gakuin (Japan); T. Ihama, Osaka Univ. (Japan); Y. Ozaki, Kwansai Gakuin (Japan); H. Masuhara, Osaka Univ. (Japan) . . . . . [5930-27]
  - 5:00 pm: **Numerical analysis of enhanced optical trapping force based on concentrating evanescent waves**, G. Wang, Indiana Univ.-Purdue Univ. Fort Wayne . . . . . [5930-28]

#### Nanotechnology Technical Group Meeting

Tuesday . . . . . 8:00 to 10:00 pm

*Chair: David Andrews, Univ. of East Anglia (United Kingdom)*

Recent issues in patenting nanotechnology-related inventions, William F. Prendergast, Brinks Hofer Gilson & Lione, Specialists in Intellectual Property Law

Specific patenting activity in the area of nanotechnology and optics, Gustavo Siller, Jr., Gilson & Lione, Specialists in Intellectual Property Law

See p. 27 for additional information.

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## Wednesday 3 August

### SESSION 8

Conv. Ctr. Room 6C ..... Wed. 8:00 to 10:00 am

#### Methods

*Chair: David McGloin, Univ. of St. Andrews (United Kingdom)*

- 8:00 am: **Self-imaged optical bottle beam based optical tweezers systems**, B. S. Ahluwalia, X. Yuan, S. Tao, Nanyang Technological Univ. (Singapore) ..... [5930-29]
- 8:20 am: **Dynamic properties measurement of vibrating microprobe for nano-position sensing using radiation pressure control**, Y. Takaya, K. Imai, S. Dejima, T. Miyoshi, Osaka Univ. (Japan) ..... [5930-30]
- 8:40 am: **Optical conveyor based on Bessel beams (Invited Paper)**, T. &#268;iřmár, Institute of Scientific Instruments (Czech Republic); V. G. Garcés-Chávez, K. Dholakia, Univ. of St. Andrews (United Kingdom); P. Zemánek, Institute of Scientific Instruments (Czech Republic) ..... [5930-31]
- 9:10 am: **Assembling mesoscopic particles by various optical schemes**, J. R. Fournier, P. M. Jacquot, R. Johann, J. Rohner, R. Salathé, École Polytechnique Fédérale de Lausanne (Switzerland) ..... [5930-32]
- 9:30 am: **GPC-driven optical micro-manipulation (Invited Paper)**, J. Glückstad, P. J. L. Rodrigo, I. Perch-Nielsen, Risø National Lab. (Denmark) ..... [5930-33]
- Coffee Break ..... 10:00 to 10:30 am

### SESSION 9

Conv. Ctr. Room 6C ..... Wed. 10:30 am to 12:00 pm

#### Bio III

*Chair: Jens-Christian D. Meiners, Univ. of Michigan*

- 10:30 am: **Dynamics of single DNA molecules under femtonewton forces (Invited Paper)**, R. Nambiar, J. D. Meiners, Univ. of Michigan ..... [5930-34]
- 11:00 am: **Variation of entropic elasticity of DNA-Psoralen complex under UV light**, O. N. Mesquita, M. S. Rocha, Univ. Federal de Minas Gerais (Brazil) ..... [5930-35]
- 11:20 am: **Using optical tweezers to study protein-DNA interactions**, D. E. Smith, G. J. Gemmen, R. Millin, J. P. Rickgauer, A. Schweitzer, D. Fuller, Univ. of California/San Diego ..... [5930-36]
- 11:40 am: **A general method for manipulating desired DNA sequences from any organism with optical tweezers**, D. Fuller, Univ. of California/San Diego; A. DuPont, Univ. of California/San Diego and École Normale Supérieure de Lyon (France); G. J. Gemmen, R. Millin, Univ. of California/San Diego; P. Recouvreux, Univ. of California/San Diego and École Normale Supérieure de Lyon (France); J. P. Rickgauer, A. Schweitzer, D. E. Smith, Univ. of California/San Diego ..... [5930-37]
- Lunch/Exhibition Break ..... 12:00 to 2:00 pm

### SESSION 10

Conv. Ctr. Room 6C ..... Wed. 2:00 to 4:20 pm

#### Materials Science

*Chair: Gabriel C. Spalding, Illinois Wesleyan Univ.*

- 2:00 pm: **Growth of protein crystals in optical tweezers (Invited Paper)**, U. J. Gibson, Dartmouth College; W. Singer, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) ..... [5930-38]
- 2:30 pm: **Optical manipulation and characterisation of aerosol droplets**, J. P. Reid, L. Mitchem, R. Hopkins, Univ. of Bristol (United Kingdom) ..... [5930-39]
- 2:50 pm: **Force measurement in colloidal glasses using optical tweezers**, L. Wilson, R. Besseling, J. Arlt, W. C. Poon, Univ. of Edinburgh (United Kingdom) ..... [5930-40]
- 3:10 pm: **Colloidal holography and crystal dislocations**, M. P. MacDonald, Univ. of St. Andrews (United Kingdom); P. A. Prentice, Univ. of Dundee (United Kingdom); K. Dholakia, Univ. of St. Andrews (United Kingdom) ..... [5930-41]
- 3:30 pm: **Phase transition in photo-absorbing single microemulsion droplets during the laser photophoretic migration**, H. Monjushiro, M. Tanaka, H. Watarai, Osaka Univ. (Japan) ..... [5930-42]
- 3:50 pm: **Applying and measuring torques using optical tweezers (Invited Paper)**, H. H. Rubinsztein-Dunlop, G. G. Knoener, S. J. W. Parkin, T. A. Nieminen, N. R. Heckenberg, W. Singer, The Univ. of Queensland (Australia) ..... [5930-95]
- 4:20 pm: **Light guidance measurements of retinal cells with a modified dual-beam laser trap**, J. R. Guck, Univ. Leipzig (Germany) ..... [5930-96]

### ✓ Posters-Wednesday

Poster authors will begin displaying posters after 10:00 am Wednesday morning in Conv. Ctr. Exhibition Hall B2. A poster reception, with authors present at their posters, will be held Wednesday evening from 5:30 to 7:00 pm. Light refreshments will be served. Poster authors, see page 272 for setup instructions.

- ✓ **Microspectroscopy and scanning microscopy in an optical tweezers system**, A. Fontes, A. de Thomaz, A. Neves, W. Moreira, L. C. Barbosa, Univ. Estadual de Campinas (Brazil); P. de Farias, B. Santos, R. Ferreira, Univ. Federal de Pernambuco (Brazil); A. de Paula, Univ. of Southampton (United Kingdom); K. Ajito, Nippon Telegraph and Telephone Corp. (Japan); C. L. Cesar, Univ. Estadual de Campinas (Brazil) ..... [5930-75]
- ✓ **Isolation of genomic DNA molecule from a single cell and control its higher order structure using optical tweezers**, H. Oana, I. Hagiya, M. Washizu, The Univ. of Tokyo (Japan); K. Kubo, K. Yoshikawa, H. Atomi, T. Imanaka, Kyoto Univ. (Japan) ..... [5930-76]
- ✓ **Determination of fluid viscosity and femto Newton forces of Leishmania amazonensis using optical tweezers**, A. Fontes, S. Giorgio, Univ. Estadual de Campinas (Brazil); A. de Castro, Jr., V. Moura Neto, Univ. Federal do Rio de Janeiro (Brazil); L. Pozzo, A. de Thomaz, Univ. Estadual de Campinas (Brazil); A. de Paula, Univ. of Southampton (United Kingdom); L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) ..... [5930-77]
- ✓ **Hydrodynamics of bacterial suspensions**, J. Arlt, W. J. Duncan, W. C. Poon, Univ. of Edinburgh (United Kingdom) ..... [5930-78]
- ✓ **Correlation of sperms' swimming force as assessed by optical tweezers to their swimming speed**, J. M. Vinson, Univ. of California/San Diego; E. L. Botvinick, Univ. of California/Irvine; B. Durrant, Conservation and Research for Endangered Species and Univ. of California/San Diego; M. W. Berns, Univ. of California/Irvine ..... [5930-79]
- ✓ **Lens-less approach to image the optically-tweezed assembly**, G. Wang, Indiana Univ.-Purdue Univ. Fort Wayne; J. B. Ketterson, Northwestern Univ. .... [5930-80]
- ✓ **Trapping objects with focused ring-shaped beams**, F. Merenda, J. Rohner, G. Boer, G. P. Delacrétaz, R. Salathé, Ecole Polytechnique Fédérale de Lausanne (Switzerland) ..... [5930-81]
- ✓ **Optical binding in experiments and theory**, V. Karásek, P. Zemánek, Institute of Scientific Instruments (Czech Republic) ..... [5930-82]
- ✓ **Nanoparticle manipulation through inter-particle optical forces and torques**, D. S. Bradshaw, D. L. Andrews, Univ. of East Anglia Norwich (United Kingdom) [5930-83]
- ✓ **Nonlinear motion of rotating glass fibers**, K. D. Bonin, A. Shelton, D. Bonessi, Wake Forest Univ.; T. Walker, Univ. of Wisconsin/Madison ..... [5930-85]
- ✓ **Theoretical calculation of trapping forces in oil-immersed microscope objectives**, R. I. Malureanu, Istituto Nazionale per la Fisica della Materia (Italy) and Univ. degli Studi di Lecce (Italy); E. M. Di Fabrizio, Istituto Nazionale per la Fisica della Materia (Italy) ..... [5930-86]
- ✓ **Comparison of reflective and transmissive spatial light modulators for optical manipulator applications**, J. L. Harriman, S. A. Serati, J. E. Stockley, Boulder Nonlinear Systems Inc. .... [5930-88]
- ✓ **'Robotase': Internet-accessible laser scissors and tweezers**, E. L. Botvinick, Univ. of California/Irvine and Univ. of California/San Diego; L. Shi, D. Little, Univ. of California/San Diego; M. W. Berns, Univ. of California/Irvine and Univ. of California/San Diego ..... [5930-90]
- ✓ **Monitoring sperm mitochondrial respiration response in a laser trap using ratiometric fluorescence**, A. Mei, E. L. Botvinick, M. W. Berns, Univ. of California/San Diego ..... [5930-91]
- ✓ **Subcellular surgery using a femtosecond laser**, N. Wakida, A. S. Dvornikov, L. L. Liaw, M. W. Berns, Beckman Laser Institute ..... [5930-93]

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## Thursday 4 August

### SESSION 11

Conv. Ctr. Room 6C ..... Thurs. 8:30 to 10:00 am

#### Near Field / Nano Traps II

Chair: **Min Gu**, Swinburne Univ. of Technology (Australia)

8:30 am: **Near-field optical manipulation by using evanescent waves and surface plasmon polaritons (Invited Paper)**, V. G. Garcés-Chávez, Univ. of St. Andrews (United Kingdom); G. C. Spalding, Illinois Wesleyan Univ.; K. Dholakia, Univ. of St. Andrews (United Kingdom) ..... [5930-43]

9:00 am: **Pattern formation in evanescent wave optical traps**, C. D. Mellor, C. D. Bain, Univ. of Oxford (United Kingdom); J. P. Lekner, Victoria Univ. of Wellington (New Zealand) ..... [5930-44]

9:20 am: **Measurement of radiation forces generated by patterned plasmon fields**, G. Volpe, D. Petrov, R. Quidant, G. Badenes, Institut de Ciències Fotoniques (Spain) ..... [5930-45]

Coffee Break ..... 9:40 to 10:30 am

### SESSION 12

Conv. Ctr. Room 6C ..... Thurs. 10:30 am to 12:00 pm

#### Lab-on-a-Chip / Microfluidic Components I

Chair: **Jochen R. Guck**, Univ. Leipzig (Germany)

10:30 am: **Optically driven micromachines for biotechnological applications (Invited Paper)**, L. Kelemen, H. Kirei, S. Valkai, P. Ormos, Biological Research Ctr. (Hungary) ..... [5930-47]

11:00 am: **All optical control of microfluidic components using form birefringence**, S. L. Neale, M. P. MacDonald, K. Dholakia, T. F. Krauss, Univ. of St. Andrews (United Kingdom) ..... [5930-48]

11:20 am: **Laser-actuated microfluidic building blocks**, C. N. Baroud, École Polytechnique (France); J. Delville, R. Wunenburger, Univ. Bordeaux 1 (France) ..... [5930-49]

11:40 am: **Optical control of electro-osmotic flow**, K. Huba, A. Der, L. Oroszi, P. Ormos, Biological Research Ctr. (Hungary) ..... [5930-50]

Lunch/Exhibition Break ..... 12:00 to 2:00 pm

### SESSION 13

Conv. Ctr. Room 6C ..... Thurs. 2:00 to 4:30 pm

#### Lab-on-a-Chip / Microfluidic Components II

Chair: **Jochen R. Guck**, Univ. Leipzig (Germany)

2:00 pm: **Laser manipulation of polymer microsensors for microfluidics and biophysics**, P. L. Baldeck, C. Lin, O. Stephan, Univ. Joseph Fourier-Grenoble (France) ..... [5930-51]

2:20 pm: **Cell diagnosis based on laser guidance**, M. Sridharan, Clemson Univ.; Y. Wei, Clemson Univ. and Greenville Hospital System; X. Peng, Shenzhen Univ. (China); Z. Gao, Clemson Univ. .... [5930-53]

2:40 pm: **Colloidal dynamics in the circularly symmetric optical potential of a Bessel beam**, G. F. Milne, D. McGloin, K. Dholakia, Univ. of St. Andrews (United Kingdom) ..... [5930-54]

Coffee Break ..... 3:00 to 3:30 pm

3:30 pm: **Cell sorting in a static optical potential landscape**, L. Paterson, Univ. of St. Andrews (United Kingdom); A. Papagiakoumou, National Technical Univ. of Athens (Greece); G. F. Milne, V. G. Garcés-Chávez, A. C. Riches, K. Dholakia, Univ. of St. Andrews (United Kingdom) ..... [5930-55]

3:50 pm: **Behavior of colloidal microparticles in interference field created by several laser beams**, P. Zemánek, T. Cizmar, M. Šiller, J. Ježek, Institute of Scientific Instruments (Czech Republic) ..... [5930-56]

4:10 pm: **Discrete transition in trapped particle position by interference effects**, K. Sasaki, Hokkaido Univ. (Japan); H. Fujiwara, JST-CREST (Japan); H. Takasaki, J. Hotta, Hokkaido Univ. (Japan) ..... [5930-57]



Editor-reviewed papers from this conference will be available online just 2 to 4 weeks after the meeting.

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