

Conference 6326
Room: Conv. Ctr. Room 6D
Sunday-Thursday 13-17 August 2006
Proceedings of SPIE Vol. 6326

Conference Sponsor: Hamamatsu

Optical Trapping and Optical Micromanipulation III

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

Program Committee: **Carlos L. Cesar**, Univ. Estadual de Campinas (Brazil); **Arthur E. T. Chiou**, National Yang Ming Univ. (Taiwan); **Jesper Glückstad**, Risø National Lab. (Denmark); **Min Gu**, Swinburne Univ. of Technology (Australia); **Philippe J. Marchand**, Celula, Inc.; **Jens-Christian D. Meiners**, Univ. of Michigan; **Lene B. Oddershede**, Univ. of Copenhagen (Denmark); **H. Daniel Ou-Yang**, Lehigh Univ.; **Rubén Ramos García II**, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); **Alexander Rohrbach**, Univ. of Freiburg (Germany); **Halina H. Rubinsztein-Dunlop**, The Univ. of Queensland (Australia)

Sunday 13 August

SESSION 1: Keynote Session

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

Room: Conv. Ctr. Room 6D

Sun. 3:30 to 4:30 pm

3:30 pm: **Laser tweezers after 20 years**, S. Chu, Lawrence Berkeley National Lab. [632601]

Conference Social Hour

Sun. 4:30 to 5:30 pm

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

Monday 14 August

SESSION 2: Basic Science I

Chair: **Halina H. Rubinsztein-Dunlop**, The Univ. of Queensland (Australia)

Room: Conv. Ctr. Room 6D

Mon. 8:20 to 10:10 am

8:20 am: **Optical trapping of atomic fermi gases** (*Invited Paper*), J. E. Thomas, Duke Univ. [632602]

8:50 am: **Rotating a Bose-Einstein condensate using photons with orbital angular momentum** (*Invited Paper*), K. Helmerson, M. Andersen, P. Clade, C. Ryu, V. Natarajan, W. D. Phillips, National Institute of Standards and Technology [632603]

9:20 am: **Optical interference fields: an excellent tool kit to study Brownian dynamics** (*Invited Paper*), P. Zemanek, T. Cizmar, M. Šiler, Institute of Scientific Instruments (Czech Republic) [632605]

9:50 am: **Molecular translational diffusion under optical force potential in solution**, S. Ito, T. Sugiyama, N. Toitani, G. Katayama, Osaka Univ. (Japan); L. Pan, N. Tamai, Kwansai Gakuin (Japan); H. Miyasaka, Osaka Univ. (Japan) [632606]

Coffee Break

10:10 to 10:30 am

SESSION 3: Fournier/Optical Binding

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

Room: Conv. Ctr. Room 6D

Mon. 10:30 am to 12:10 pm

10:30 am: **Multiple optical trapping in high gradient interference fringes**, J. Rohner, J. R. Fournier, P. M. Jacquot, F. Merenda, R. Salathé, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [632607]

10:50 am: **Collective oscillations in optical matter**, F. J. Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) [632604]

11:10 am: **Optical binding in non-diffracting beams**, V. Karasek, T. Cizmar, P. Zemanek, Institute of Scientific Instruments (Czech Republic) [632609]

11:30 am: **Enhancement mechanisms for optical forces in integrated optics**, M. L. Povinelli, Stanford Univ.; M. Loncar, E. J. Smythe, Harvard Univ.; M. Ibanescu, S. G. Johnson, Massachusetts Institute of Technology; F. Capasso, Harvard Univ.; J. D. Joannopoulos, Massachusetts Institute of Technology [632610]

11:50 am: **Optically induced forces between photonic waveguides**, M. Loncar, Harvard Univ.; M. L. Povinelli, Stanford Univ.; E. J. Smythe, Harvard Univ.; M. Ibanescu, Massachusetts Institute of Technology; M. Hochberg, T. Baehr-Jones, A. Scherer, California Institute of Technology; S. G. Johnson, J. D. Joannopoulos, Massachusetts Institute of Technology; F. Capasso, Harvard Univ. [632611]

Lunch Break

12:10 to 1:30 pm

SESSION 4: Near-Field Optical Micromanipulation

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

Room: Conv. Ctr. Room 6D

Mon. 1:30 to 3:10 pm

1:30 pm: **An evanescently trapped microsphere as a microfluidic particle router**, V. G. Garcés-Chávez, Univ. of St. Andrews (United Kingdom); S. Kuriakose, Swinburne Univ. of Technology (Australia); P. J. Reece, Univ. of St. Andrews (United Kingdom); M. Gu, Swinburne Univ. of Technology (Australia); K. Dholakia, Univ. of St. Andrews (United Kingdom) [632612]

1:50 pm: **Dielectric resonator: cavity-enhanced optical manipulation in the near field**, P. J. Reece, V. G. Garcés-Chávez, K. Dholakia, Univ. of St. Andrews (United Kingdom) [632613]

2:10 pm: **Enhanced whispering gallery modes induced by evanescent two-photon absorption**, S. Kuriakose, D. Morrish, X. Gan, J. W. M. Chon, M. Gu, Swinburne Univ. of Technology (Australia) [632614]

2:30 pm:

2:50 pm: **Optical forces on a lensless trap**, V. Ruiz-Cortes, J. P. Vite-Frias, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) [632616]

Coffee Break

3:10 to 3:30 pm

SESSION 5: Basic Science II

Room: Conv. Ctr. Room 6D

Mon. 3:30 to 5:50 pm

3:30 pm: **Subwavelength trapping volumes created using negative refraction**, M. Mazilu, K. Dholakia, Univ. of St. Andrews (United Kingdom) [632617]

3:50 pm: **Single-beam trapping of microbeads in polarized light: dependence of trap stiffness on polarization state**, M. Mansuripur, A. R. Zakharian, J. V. Moloney, College of Optical Sciences/The Univ. of Arizona [632618]

4:10 pm: **Fundamental electromagnetics and optical tweezers**, R. N. C. Pfeifer, T. A. Nieminen, The Univ. of Queensland (Australia) [632619]

4:30 pm: **Optomechanical forces and electrostriction in laser optical materials**, D. L. Andrews, Univ. of East Anglia Norwich (United Kingdom) [632620]

4:50 pm: **Exact partial wave expansion of optical beams with respect to arbitrary origin**, A. Á. R. Neves, A. Fontes, W. L. Moreira, A. A. d. Thomaz, D. B. d. Almeida, L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) [632621]

5:10 pm: **Calculation of optical trapping landscapes and application to refractive index measurements**, G. G. Knöner, T. A. Nieminen, S. J. W. Parkin, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) [632622]

5:30 pm: **Double optical tweezers for 3D photonic force: measurements of Mie scatterers**, A. Á. R. Neves, A. Fontes, W. L. Moreira, A. A. d. Thomaz, D. B. d. Almeida, L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) [632623]

Posters - Monday

Room: Conv. Ctr. Room 6D

Mon. 6:00 to 7:30 pm

Poster authors will begin displaying posters after 10:00 am Monday morning. A poster session, 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 xx for setup instructions.

Calibration and performance of dual-beam force-measuring optical tweezers, D. E. Smith, A. L. Schweitzer, J. P. Rickgauer, Univ. of California/San Diego [632678]

DNA looping and cleavage properties of restriction endonucleases studied by optical tweezers manipulation of single DNA molecules, D. E. Smith, G. J. Gemmen, R. Millin, Univ. of California/San Diego [632679]

Manipulation of yeast chromosomal DNA using optically driven microstructures, K. Terao, The Univ. of Tokyo (Japan); H. Kabata, Kyoto Univ. (Japan); H. Oana, M. Washizu, The Univ. of Tokyo (Japan) [632680]

Precise determination of object position in 1D optical lattice, T. Cizmar, P. Zemanek, Institute of Scientific Instruments (Czech Republic) [632681]

Combining confocal microscopy with precise force-scope optical tweezers, A. C. Richardson, L. B. Oddershede, Niels Bohr Institute (Denmark) [632682]

Growth of single yeast cells in an optical trap monitored by Rayleigh and Raman scattering, G. P. Singh, G. Volpe, R. Alcaide, D. Petrov, Institut de Ciències Fotòniques (Spain) [632684]

Chemotaxis study using optical tweezers to observe the strength and directionality of forces of Leishmania amazonensis, L. d. Y. Pozzo, A. Fontes, A. A. de Thomaz, L. C. Barbosa, D. C. Ayres, C. B. C. Lima, S. Giorgio, C. L. Cesar, Univ. Estadual de Campinas (Brazil) [632685]

Optically guided neuronal growth at near-infrared wavelengths, D. J. Stevenson, Univ. of St. Andrews (United Kingdom); T. Lake, Edinburgh Instruments Ltd. (United Kingdom); B. Agate, F. Gunn-Moore, K. Dholakia, Univ. of St. Andrews (United Kingdom) [632686]

Mitotic spindle studied using picosecond laser scissors, N. M. Baker, Univ. of California/San Diego; E. L. Botvinick, M. W. Berns, Univ. of California/Irvine [632687]

Effects of optically driven helical bacteria, H. Schmitzer, D. A. Tierney, Xavier Univ.; J. R. Robbins, Saint Mary's College of California [632688]

RBC under optical tweezers as cellular motors and rockers: microfluidic applications, S. K. Mohanty, Ctr. for Advanced Technology (India); K. S. Mohanty, Maharaja Sayajirao Univ. of Baroda (India); P. K. Gupta, Ctr. for Advanced Technology (India) [632689]

A novel laser tweezers for big size particles, J. Chen, Beijing Univ. of Technology (China) [632690]

Observation and simulation of optical diffraction pattern of a rotating microgear, L. Kelemen, P. Ormos, Biological Research Ctr. (Hungary); N. K. Metzger, W. Sibbett, K. Dholakia, Univ. of St Andrews (United Kingdom) [632691]

Narrow polymer fibers obtained as a combination of photopolymerization and optical confinement, J. Jezek, T. Cizmar, P. Zemanek, Institute of Scientific Instruments (Czech Republic) [632693]

Tuesday 15 August

Organic and Nanophotonics Plenary Session

Tues. 8:30 am to 12:00 pm

Tuesday 15 August * 8:30 am to 12:00 pm

Chairs: **James G. Grote**, Air Force Research Lab.; **Zakya H. Kafafi**, Naval Research Lab.

Increasing the Density and Functionality of Photonic Integration with Nano-Waveguides and Nanostructures
Sailing He, Royal Institute of Technology - KTH (Sweden) and Joint Research Center of Photonics of KTH (Sweden) and Zhejiang Univ. (China)

Plasmonics
Naomi Halas, Rice Univ.

Organic Thin Film Electronics
Zhenan Bao, Stanford Univ.

A Review on Nano-Photonics Research at NRL
Richard J. Colton, Naval Research Lab.

OLEDs for Flat Panel Displays and Solid-State Lighting
Franky So, Univ. of Florida

Organic Solar Cells
Christoph J. Brabec, Konarka Technologies GmbH (Germany)

See p. XX for additional information.

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 6: Bio I

Chair: **John C. Butler**, Univ. of Illinois at Urbana-Champaign
Room: Conv. Ctr. Room 6D

Tues. 1:30 to 3:00 pm

1:30 pm: **The dual-beam laser trap: current applications in biophysics and biomedicine** (*Invited Paper*), J. R. Guck, S. Ebert, B. Lincoln, F. Wottawah, S. Schinkinger, M. Kreysing, K. Travis, Univ. Leipzig (Germany) [632624]

2:00 pm: **Measuring electrical and mechanical properties of red blood cells with a double optical tweezers**, A. Fontes, H. P. Fernandes, M. d. L. Barjas-Castro, A. A. de Thomaz, L. d. Y. Pozzo, L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) [632625]

2:20 pm: **A microfluidic system for studies of stress response in single cells using optical tweezers**, A. C. V. Granéli, E. Eriksson, J. Enger, K. K. Ramser, M. F. Goksör-Ericsson, D. Hanstorp, Göteborg Univ. (Sweden) [632626]

2:40 pm: **Optical trapping dynamics for cell identification**, G. Volpe, G. P. Singh, F. Büttner, A. Morales, D. Petrov, Institut de Ciències Fotòniques (Spain) [632627]

Coffee Break 3:00 to 3:20 pm

SESSION 7: Bio II

Chair: **John C. Butler**, Univ. of Illinois at Urbana-Champaign
Room: Conv. Ctr. Room 6D

Tues. 3:20 to 5:20 pm

3:20 pm: **Elastic light scattering studies from single cells in optical trap**, D. A. Watson, La Jolla Bioengineering Institute [632628]

3:40 pm: **Interactive space-time controlled application of different stimuli for cells dynamics study**, F. Belloni, S. Monneret, Institut Fresnel (France); D. D. Marguet, Ctr. National de la Recherche Scientifique (France) [632629]

4:00 pm: **Ultra-localized flow fields applied to the cell surface**, E. L. Botvinick, Univ. of California/Irvine; G. G. Knöner, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia); M. W. Berns, Univ. of California/Irvine [632630]

4:20 pm: **The influence of extract of Reishi polysaccharides on the binding/uptake of lipopolysaccharide-**

coated polystyrene particle on macrophage measured by optical tweezers, M. Wei, K. Hua, J. Hsu, A. V. Karmenyan, H. Hsu, A. E. T. Chiou, National Yang Ming Univ. (Taiwan) [632631]

4:40 pm: **Raman imaging of neoplastic cells in suspension**, C. M. Creely, S. Mercadal, G. Volpe, D. Petrov, Institut de Ciències Fotòniques (Spain) [632632]

5:00 pm: **Real-time single sperm tracking, laser trapping, and fluorescence imaging system**, L. Z. Shi, Univ. of California/San Diego; E. L. Botvinick, Univ. of California/Irvine; J. Nascimento, Univ. of California/San Diego; M. W. Berns, Univ. of California/Irvine [632633]

Introduction to Optical Tweezers and Optical Manipulation

Room: Conv. Ctr. Room 6D

Tues. 6:00 to 10:00 pm

Tues. * 6:00 to 10:00 pm Don't miss this opportunity to learn more about the use and implementation of optical micromanipulation systems. In addition to valuable background knowledge, the course provides "hands-on" experience using a real optical tweezers system. The course is taught by conference co-chairs Kishan Dholakia and Gabe Spalding.

SC655 - Tuesday 15 August, 6:00 to 10:00 pm \$220 SPIE Members / \$260

Non-Members See p. xx for details.

Nanotechnology Technical Group Meeting

Tues. 8:00 to 10:00 pm

Tuesday 2 August * 8:00 to 10:00 pm

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

Health Issues in Nanotechnology

This meeting of the Nanotechnology Group, open to all, will focus on health and safety issues of using nanomaterials. There is a great deal of uncertainty and misinformation in this area, and much public concern, and sharing knowledge between practitioners and interested parties is essential. Open discussion will follow special presentations by invited speakers giving two very different perspectives on the potential risks and benefits.

A Prudent Approach to Nanotech Environmental, Health and Safety Risks

Michael Holman, Lux Research, Inc.

The Efficacy and Safety of Intravenously Injected Nanoparticles for Cancer Therapy

J. Donald Payne, Nanospectra Biosciences, Inc.

* This meeting is open to all attendees.

See page XX for additional information.

Wednesday 16 August

SESSION 8: Microfluidics I

Chair: **Philippe J. Marchand**, Celula, Inc.

Room: Conv. Ctr. Room 6D

Wed. 8:10 to 10:10 am

8:10 am: **An optically driven pump for microfluidics**, H. M. Mushfique, J. Leach, Univ. of Glasgow (United Kingdom); R. Di Leonardo, Univ. of Glasgow (United Kingdom) and INFM-CRS SOFT (Italy); M. J. Padgett, J. M. Cooper, Univ. of Glasgow (United Kingdom) [632634]

8:30 am: **Single shot and highly parallel photopolymerisation with complex light patterns generated by diffractive optical elements**, L. Kelemen, L. Fábíán, S. Valkai, P. Ormos, Biological Research Ctr. (Hungary) [632635]

8:50 am: **Grasping microscopic objects by multiple tools actuated by optical tweezers**, S. Sung, I. Park, J. Lee, Y. Lee, Gwangju Institute of Science and Technology [632636]

9:10 am: **An optical trapped nanohand for manipulating micron-sized particles**, L. Baron, F. Beck, G. M. Gibson, G. Whyte, M. J. Padgett, Univ. of Glasgow (United Kingdom) [632637]

9:30 am: **Snap-fit assembly of microscopic components by optical tweezers**, J. Baek, S. Hwang, J. Lee, Y. Lee, Gwangju Institute of Science and Technology [632638]

9:50 am: **Optically controlled flow pattern in microfluidic devices**, L. Oroszi, A. Dér, H. Kirei, Biological Research Ctr. (Hungary); V. Rakovics, Muszaki Fizikai es Anyagtudományi Kutatóintézet (Hungary); P. Ormos, Biological Research Ctr. (Hungary) [632639]

Coffee Break

10:10 to 10:30 am

SESSION 9: Microfluidics II: Sorting

Chair: **Michael P. MacDonald**, Univ. of St. Andrews (United Kingdom)

Room: Conv. Ctr. Room 6D

Wed. 10:30 am to 12:10 pm

10:30 am: **Optical chromatography for concentration of biological samples**, S. J. Hart, Naval Research Lab.; A. V. Terray, SAIC; T. A. Leski, J. Arnold, Naval Research Lab. [632640]

10:50 am: **Static particle sorting in 1D optical lattice**, P. Jakl, T. Cizmar, M. Šerý, P. Zemanek, Institute of Scientific Instruments (Czech Republic) [632641]

11:10 am: **The response of particles with anisotropic shape within an optical landscape and laminar flow**, B. L. Conover, M. J. Escuti, North Carolina State Univ. [632642]

11:30 am: **Optical separation of particles based on a dynamic interferometer**, W. Mu, Northwestern Univ.; G. Wang, Indiana Univ.–Purdue Univ. Fort Wayne; G. C. Spalding, Illinois Wesleyan Univ.; L. Luan, J. B. Ketterson, Northwestern Univ. [632643]

11:50 am: **Characterization of an interferometric optical sieve for particle sorting**, I. Ricardez-Vargas, P. Rodriguez-Montero, R. Ramos García II, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); K. P. Volke-Sepulveda, Univ. Nacional Autónoma de México (Mexico) [632644]

Lunch/Exhibition Break

12:10 to 1:30 pm

SESSION 10: Ensembles

Chair: **Jesper Gluckstad**, Risø National Lab. (Denmark)

Room: Conv. Ctr. Room 6D

Wed. 1:30 to 3:00 pm

1:30 pm: **Optically-controlled manipulation of live cells using incoherent light-driven optoelectronic tweezers** (*Invited Paper*), A. T. Ohta, P. Chiou, A. Jamshidi, H. Hsu, M. C. Wu, Univ. of California/Berkeley [632645]

2:00 pm: **Size resolution with light-induced dielectrophoresis (LIDEP)**, S. L. Neale, M. P. MacDonald, M. Mazilu, K. Dholakia, T. F. Krauss, Univ. of St. Andrews (United Kingdom) [632646]

2:20 pm: **Optical micromanipulation of synthetic macromolecules**, W. Singer, T. A. Nieminen, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) [632647]

2:40 pm: **Optical trapping and two-photon fluorescence analysis of pseudoisocyanine J-aggregates in solution**, H. Yoshikawa, Y. Tanaka, H. M. Masuhara, Osaka Univ. (Japan) [632648]

Coffee Break

3:00 to 3:30 pm

SESSION 11: Novel Beams

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

Room: Conv. Ctr. Room 6D

Wed. 3:30 to 5:50 pm

3:30 pm: **Optical measurement of the total angular momentum of light**, S. J. W. Parkin, G. G. Knöner, T. A. Nieminen, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) [632649]

3:50 pm: **An intuitive view of the origin of orbital angular momentum in optical vortices**, S. Tseng, L. Hsu, National Chiao Tung Univ. (Taiwan) [632650]

4:10 pm: **Optical design for generating Bessel beams for micromanipulation**, J. G. Smith, A. Stockham, MEMS Optical, Inc. [632651]

4:30 pm: **Optical guiding of aerosols**, M. D. Summers, D. McGloin, Univ. of St. Andrews (United Kingdom); J. P. Reid, Univ. of Bristol (United Kingdom) [632652]

4:50 pm: **Tunable acoustic gradient index of refraction lenses for generating rapidly changing Bessel beams**, C. B. Arnold, A. B. Hopkins, E. J. R. B. McLeod, Princeton Univ. [632653]

5:10 pm: **Enhanced particle guiding using supercontinuum radiation**, P. Fischer, A. E. Carruthers, H. Little, C. T. A. Brown, W. Sibbett, Univ. of St. Andrews (United Kingdom); E. M. Wriarth, The Univ. of Arizona and Univ. of St. Andrews (United Kingdom); K. Dholakia, Univ. of St. Andrews (United Kingdom) and College of Optical Sciences/Univ. of Arizona [632654]

5:30 pm: **Single-particle optical scattering spectroscopy in white light supercontinuum optical tweezers**, P. Li, K. Shi, Z. Liu, The Pennsylvania State Univ. [632655]

Posters - Wednesday

Room: Conv. Ctr. Room 6D

Wed. 5:30 to 7:00 pm

Poster authors will begin displaying posters after 10:00 am Wednesday morning. A poster session, 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 xx for setup instructions.

Phase conjugation and four-wave mixing in a colloidal crystal, C. López-Mariscal, J. C. Gutiérrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); D. McGloin, K. Dholakia, Univ. of St. Andrews (United Kingdom) [632694]

Submicron-scale Brownian swimmer or surfer in 1D standing wave optical traps, M. Siler, T. Cizmar, P. Zemanek, Institute of Scientific Instruments (Czech Republic) [632696]

Manipulating and probing the spatio-temporal dynamics of nanoparticles, M. Kyoung, E. D. Sheets, The Pennsylvania State Univ. [632697]

Patterning surfaces using optical tweezers, A. van der Horst, FOM Institute for Atomic and Molecular Physics (Netherlands) and Univ. Utrecht (Netherlands); A. I. Campbell, E. C. M. Vermolen, Univ. Utrecht (Netherlands); M. Dogterom, FOM Institute for Atomic and Molecular Physics (Netherlands); A. van Blaaderen, Univ. Utrecht (Netherlands) [632698]

Sorting with a translating optical lattice, R. L. Smith, G. C. Spalding, Illinois Wesleyan Univ.; M. P. MacDonald, S. L. Neale, K. Dholakia, Univ. of St. Andrews (United Kingdom) [632699]

Continuous microfluidic sorting using sol-gel microlens array, Y. Sun, X. Yuan, L. S. Ong, S. Tao, M. He, Nanyang Technological Univ. (Singapore) [6326100]

Visualization of optical binding, N. K. Metzger, W. Sibbett, K. Dholakia, Univ. of St. Andrews (United Kingdom) [6326101]

Design of a low-cost interactive holographic optical tweezer system, E. Pleguezuelos, J. Andilla, A. Carnicer, E. Martin-Badosa, S. Vallmitjana, M. Montes-Usategui, Univ. de Barcelona (Spain) [6326102]

A simple technique for dynamic optical tweezers using mirror on a vibrating membrane, C. F. Cheong, National Univ. of Singapore (Singapore) [6326103]

Multiple trap Laguerre-Gaussian holographic optical tweezers using a multiplexed ferroelectric SLM, A. Lafong, W. J. Hossack, J. Arlt, T. J. Nowakowski, N. D. Read, Univ. of Edinburgh (United Kingdom) [6326104]

Real-time optical dragging of particles using a phase shift method, T. Iwai, Tokyo Univ. of Agriculture and Technology (Japan); J. Yamamoto, Hokkaido Univ. (Japan) [6326105]

Optical tweezing beam control using liquid crystal adaptive optical elements, P. J. W. Hands, S. A. Tatarkova, A. K. Kirby, G. D. Love, Univ. of Durham (United Kingdom) [6326106]

Force trapping gradient using diffractive optical elements, A. Moradi, Institute for Advanced Studies in Basic Sciences (Iran); E. Ferrari, V. Garbin, E. M. Di Fabrizio, D. A. Cojoc, Lab. Nazionale TASC/INFM (Italy) [6326107]

Spatial light modulator considerations for beam control in optical manipulation applications, S. A. Serati,

Boulder Nonlinear Systems Inc. [6326109]

Algorithm for computing holographic optical tweezers at video rates, M. Montes-Usategui, E. Pleguezuelos, J. Andilla, E. Martin-Badosa, I. P. Juvells, Univ. de Barcelona (Spain) [6326110]

Holographic optical tweezers aberration correction using adaptive, K. D. Wulff, D. G. Cole, R. L. Clark, Jr., Duke Univ.; R. Di Leonardo, Univ. degli Studi di Roma/La Sapienza (Italy); J. Leach, J. M. Cooper, G. M. Gibson, M. J. Padgett, Univ. of Glasgow (United Kingdom) [6326111]

GPC-based counterpropagating-beam traps with unequally sized intensity profiles, P. J. L. Rodrigo, I. R. Perch-Nielsen, J. Gluckstad, Risø National Lab. (Denmark) [6326112]

Laser manipulation and characterization of liquid crystal droplets, H. Misawa, N. Murazawa, S. Juodkazis, Hokkaido Univ. (Japan) [6326113]

Thursday 17 August

SESSION 12: Opto-Fluidics

Chair: **H. Daniel Ou-Yang**, Lehigh Univ.

Room: Conv. Ctr. Room 6D

Thurs. 8:10 to 10:20 am

8:10 am: **Controlled aerosol manipulation using holographic optical tweezers**, D. McGloin, Univ. of St. Andrews (United Kingdom) and Univ. of Washington; D. R. Burnham, Univ. of St. Andrews (United Kingdom) [632656]

8:30 am: **Multipoint holographic optical velocimetry in microfluidic systems**, J. Leach, Univ. of Glasgow (United Kingdom); R. Di Leonardo, Univ. of Glasgow (United Kingdom) and INFM-CRS SOFT (Italy); H. M. Mushfique, J. M. Cooper, M. J. Padgett, Univ. of Glasgow (United Kingdom) [632657]

8:50 am: **Interparticle hydrodynamic couplings in optical tweezers**, S. Keen, J. Leach, Univ. of Glasgow (United Kingdom); R. Di Leonardo, Univ. of Glasgow (United Kingdom) and Univ. di Roma La Sapienza (Italy); G. M. Gibson, M. J. Padgett, Univ. of Glasgow (United Kingdom) [632658]

9:10 am: **Shape dynamics of lipid vesicles forced by holographic optical tweezers**, W. Losert, J. Meszaroz, C. Poole, Univ. of Maryland/College Park [632659]

9:30 am: **Combined laser trapping and small-angle x-ray scattering experiment for the study of liposome colloidal microparticles**, D. A. Cojoc, Lab. Nazionale TASC/INFM (Italy); H. Amenitsch, Institute of Biophysics and X-Ray Structure Research (Austria); C. Riekkel, European Synchrotron Radiation Facility (France); E. Ferrari, Lab. Nazionale TASC/INFM (Italy); M. Rappolt, Institute of Biophysics and X-Ray Structure Research (Austria); V. Garbin, Lab. Nazionale TASC/INFM (Italy); B. Sartori, Institute of Biophysics and X-Ray Structure Research (Austria); M. Burghammer, European Synchrotron Radiation Facility (France); E. M. Di Fabrizio, Lab. Nazionale TASC/INFM (Italy) [632660]

9:50 am: **Opto-bio-fluidic modeling of bioanalytical and biomedical microdevices** (*Invited Paper*), A. J. Przekwas, Z. Sikorski, CFD Research Corp. [632661]

Coffee Break

10:20 to 10:40 am

SESSION 13: Materials Science I

Chair: **Carlos L. Cesar**, Univ. Estadual de Campinas (Brazil)

Room: Conv. Ctr. Room 6D

Thurs. 10:40 am to 12:20 pm

10:40 am: **The design and biological applications of dual-beam oscillating optical tweezers-based imaging cytorheometer**, H. D. Ou-Yang, J. Wang, Lehigh Univ. [632662]

11:00 am: **Linear and nonlinear microrheology of dense colloidal suspensions**, L. Wilson, J. Arlt, R. Besseling, W. C. K. Poon, Univ. of Edinburgh (United Kingdom) [632663]

11:20 am: **Defects, structures, and elasticity-mediated colloidal interactions in liquid crystals studied using laser tweezers**, I. I. Smalyukh, Kent State Univ.; G. C. L. Wong, Univ. of Illinois at Urbana-Champaign; B. I.

Senyuk, O. D. Lavrentovich, Kent State Univ.; A. N. Kuzmin, A. V. Kachynski, P. N. Prasad, SUNY/Univ. at Buffalo [632664]

11:40 am: **Measuring femtonewton forces between charged colloidal particles**, E. R. Dufresne, S. Sainis, V. Germain, Yale Univ. [632665]

12:00 pm: **Optical manipulation of nanoparticles within tortuously constrained geometries**, R. J. Kershner, W. Chae, P. V. Braun, Univ. of Illinois at Urbana-Champaign; G. C. Spalding, Illinois Wesleyan Univ. [632666]

Lunch/Exhibition Break

12:20 to 1:30 pm

SESSION 14: Materials Science II

Chair: **Ryan J. Kershner**, Univ. of Illinois at Urbana-Champaign

Room: Conv. Ctr. Room 6D

Thurs. 1:30 to 3:00 pm

1:30 pm: **High-index particles in counter-propagating traps** (*Invited Paper*), A. van der Horst, FOM Institute for Atomic and Molecular Physics (Netherlands) and Univ. Utrecht (Netherlands); A. van Blaaderen, Univ. Utrecht (Netherlands); M. Dogterom, FOM Institute for Atomic and Molecular Physics (Netherlands) [632667]

2:00 pm: **Holographic optical tweezers for manipulations on an air/liquid interface**, A. Jesacher, S. Fürhapter, C. Maurer, S. Bernet, M. A. Ritsch-Marte, Innsbruck Medical Univ. (Austria) [632668]

2:20 pm: **Time-resolved nanoseconds dynamics of ultrasound contrast agent microbubbles manipulated and controlled by optical tweezers**, V. Garbin, D. A. Cojoc, E. Ferrari, Lab. Nazionale TASC/INFM (Italy); E. M. Di Fabrizio, Univ. degli studi Magna Græcia di Catanzaro (Italy); M. L. J. Overvelde, M. Versluis, S. M. van der Meer, Univ. Twente (Netherlands); N. de Jong, Erasmus Univ. Medical Ctr. (Netherlands); D. Lohse, Univ. Twente (Netherlands) [632669]

2:40 pm: **The 3D manipulation of a microsphere for nano-CMM probe using single fiber optical trapping**, S. I. Eom, Y. Takaya, T. Miyoshi, T. Hayashi, Osaka Univ. (Japan) [632670]

Coffee Break

3:00 to 3:20 pm

SESSION 15: Bio III

Chair: **Arthur E. T. Chiou**, National Yang-Ming Univ. (Taiwan)

Room: Conv. Ctr. Room 6D

Thurs. 3:20 to 5:50 pm

3:20 pm: **An autonomous and adapting system for long-term optical trapping of yeast in a microfluidic system**, I. R. Perch-Nielsen, Risø National Lab. (Denmark); E. Eriksson, M. F. Goksör-Ericsson, J. Enger, Göteborg Univ. (Sweden); P. J. L. Rodrigo, Risø National Lab. (Denmark); D. Hanstorp, Göteborg Univ. (Sweden); J. Glückstad, Risø National Lab. (Denmark) [632671]

3:40 pm: **Artificially patterned bacterial biofilms**, J. C. Butler, I. Smalyukh, Univ. of Illinois at Urbana-Champaign; J. Shrout, The Univ. of Iowa; G. C. Spalding, Illinois Wesleyan Univ.; M. J. Parsek, Univ. of Washington; G. C. L. Wong, Univ. of Illinois at Urbana-Champaign [632672]

4:00 pm: **Stable and robust nanotubes formed from self-assembled polymer membranes**, K. Helmerson, J. E. Reiner, R. Kishore, A. Jofre, National Institute of Standards and Technology; C. Pfefferkorn, Gettysburg College [632673]

4:20 pm: **Optical tweezers for single molecule force spectroscopy on bacterial adhesion organelles** (*Invited Paper*), M. J. Andersson, O. Axner, B. E. Uhlin, E. G. Fällman, Umeå Univ. (Sweden) [632674]

4:50 pm: **Optical stretching of a short nucleic acid polymer**, N. Reihani, L. Bosanac, T. M. Hansen, L. B. Oddershede, Niels Bohr Institute (Denmark) [632675]

5:10 pm: **Dependence of bacteriophage ϕ 29 DNA packaging on ionic conditions studied by optical tweezers manipulation of single DNA molecules**, D. N. Fuller, J. P. Rickgauer, Univ. of California/San Diego; S. Grimes, P. J. Jardine, D. L. Anderson, Univ. of Minnesota; D. E. Smith, Univ. of California/San Diego [632676]

5:30 pm: **Initiation of bacteriophage ϕ 29 DNA packaging studied by optical tweezers manipulation of single**

DNA molecules, J. P. Rickgauer, D. N. Fuller, Univ. of California/San Diego; S. Grimes, P. J. Jardine, D. L. Anderson, Univ. of Minnesota; D. E. Smith, Univ. of California/San Diego [632677]