

Conference 6644

Sunday-Wednesday 26-29 August 2007 • Proceedings of SPIE Vol. 6644

Optical Trapping and Optical Micromanipulation IV

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

Program Committee: **Elliot L. Botvinick**, Beckman Laser Institute; **Carlos L. César**, Univ. Estadual de Campinas (Brazil); **Arthur E. T. Chiou**, National Yang-Ming Univ. (Taiwan); **Eric R. Dufresne**, Yale Univ.; **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**, Niels Bohr Institute (Denmark); **H. D. Ou-Yang**, Lehigh Univ.; **Rubén Ramos-García II**, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); **Alexander Rohrbach**, Albert-Ludwigs-Univ. Freiburg (Germany); **Halina H. Rubinsztein-Dunlop**, The Univ. of Queensland (Australia)

Sunday 26 August

SESSION 1 Sun. 8:00 to 10:10 am

Optical Traps and DNA

Chair: **Justin E. Molloy**, National Institute for Medical Research (United Kingdom)

Visualizing single DNA-bound proteins using DNA as a scanning probe (Invited Paper), G. J. L. Wuite, Vrije Univ. Amsterdam (Netherlands) [6644-01]

Stretching sub-micron DNA fragments with optical tweezers (Invited Paper), Y. Chen, G. A. Blab, J. D. Meiners, Univ. of Michigan [6644-02]

Studies of viral DNA packaging motors with optical tweezers: a comparison of motor function in bacteriophages phi29, lambda, and T4, D. E. Smith, D. N. Fuller, D. Raymer, J. P. Rickgauer, Univ. of California/San Diego; S. Grimes, P. J. Jardine, D. L. Anderson, Univ. of Minnesota; C. Catalano, Univ. of Washington; V. Kottadiel, V. Rao, The Catholic Univ. of America [6644-03]

Mechanisms of DNA binding determined in optical tweezers experiments, M. J. McCauley, M. C. Williams, Northeastern Univ. [6644-04]

High-resolution single-molecule optical trapping measurements of transcription with basepair accuracy (Invited Paper), W. J. Greenleaf, E. A. Abbondanzieri, Stanford Univ.; M. T. Woodside, Stanford Univ. and National Research Council of Canada (Canada); R. Landick, Univ. of Wisconsin/Madison; S. M. Block, Stanford Univ. [6644-05]

SESSION 2 Sun. 10:30 am to 12:00 pm

Statistical Mechanics of Small Systems

Chair: **Kirstine Berg-Sørensen**, Danmarks Tekniske Univ. (Denmark)

Fluctuation and dissipation theorems: theory and experiment (Invited Paper), D. J. Evans, E. M. Sevick, G. Wang, D. M. Carberry, J. C. Reid, The Australian National Univ. (Australia); D. J. Searles, Griffith Univ. (Australia) .. [6644-06]

An optical trap with colored noise, S. Perrone, Institut de Ciències Fotòniques (Spain); M. Rubi, Univ. de Barcelona (Spain); D. Petrov, Institut de Ciències Fotòniques (Spain) [6644-07]

The determination of the second virial coefficient of colloidal particles by forced Rayleigh light scattering in the vicinity of a blinking optical trap, J. Junio, E. Blanton, H. D. Ou-Yang, Lehigh Univ. [6644-08]

Brownian motion in a non-homogeneous field of force, G. Volpe, D. Petrov, Institut de Ciències Fotòniques (Spain) [6644-09]

Lunch Break

SESSION 3 Sun. 1:30 to 3:10 pm

Single Molecule Studies

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

Optical trapping studies of acto-myosin motor proteins (Invited Paper), J. E. Molloy, National Institute for Medical Research (United Kingdom) [6644-10]

Direct measurement of the intermolecular forces confining a single entangled polymer, R. M. Robertson, D. E. Smith, Univ. of California/San Diego [6644-11]

Optically trapped water droplets as nanocontainers (Invited Paper), K. Helmerson, A. M. Jofre, J. Tang, R. B. Kishore, L. S. Goldner, National Institute of Standards and Technology [6644-12]

Hydrosomes: optically trapped femtoliter containers for single molecule studies, A. M. Jofre, R. B. Kishore, National Institute of Standards and Technology; N. Hodas, California Institute of Technology; J. Tang, G. Lowman, L. S. Goldner, K. Helmerson, National Institute of Standards and Technology [6644-13]

SESSION 4 Sun. 3:30 to 5:10 pm

Triggered Events in Biological Systems

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

Forced shape deformations of interfaces and biopolymer networks, W. Losert, A. Pomerance, E. Rericha, Univ. of Maryland/College Park [6644-14]

A laser microscope system for mechanotransduction studies on cells, S. K. Mohanty, Univ. of California/Irvine; H. H. Rubinsztein-Dunlop, The Univ. of Queensland; E. L. Botvinick, Univ. of California/Irvine [6644-15]

Optical tweezers and multiphoton microscopies integrated photonic tool for mechanical and biochemical cell processes studies, A. A. de Thomaz, W. M. Faustino, Univ. Estadual de Campinas (Brazil); A. Fontes, Univ. Federal de Pernambuco (Brazil); H. P. Fernandes, M. d. L. Barjas-Castro, K. Metzke, S. Giorgio, L. C. Barbosa, C. L. Cesar, Univ. Estadual de Campinas (Brazil) [6644-16]

Optical tweezers guided control of neuronal cell growth: effect of beam asymmetry and power on different cell types, S. K. Mohanty, C. Sun, M. W. Berns, Univ. of California/Irvine [6644-17]

Optical tweezers for studying DNA repair and ageing, K. O. Greulich, Fritz Lipmann Institute (Germany); S. Monajembashi, Fritz Lipmann Institute (Germany) and Consultant (Germany); T. Keining, P. Grigaravicius, Fritz Lipmann Institute (Germany) [6644-18]

All-Conference Plenary

Session Sun. 6:00 to 7:30 pm

6:00 to 6:45 pm: **Technology to Enable our Solar Technology Future**, D. W. Merfeld, GE Global Research

6:45 to 7:30 pm: **The Concept of the Photon - Updated**, M. O. Scully, Texas A&M Univ.

See p. 8 for presentation overview.

Monday 27 August

Plenary Session Mon. 8:30 am to 12:00 pm

NanoScience and Engineering

8:30 am: **Optically Driven Mechanical Micro/Nanosystems in Classical and Quantum Realms**, Halina Rubinsztein-Dunlop, The Univ. of Queensland (Australia)

9:00 am: **Plastic Optoelectronics and Aligned Carbon Nanotube Nanodevices**, Liming Dai, Univ. of Dayton

9:30 am: **Brave New Nanoworld, Without Apologies to Aldous Huxley**, Akhlesh Lakhtakia, The Pennsylvania State Univ.

Coffee Break 10:00 to 10:30 am

10:30 am: **High Performance Organic Electronic Devices Based on Nano-Scale Engineering**, Yang Yang, Univ. of California/Los Angeles

11:00 am: **Nanotechnology: New Tool for Diagnostics and Treatment of Cancer**, Michael Heller, Univ. of California/San Diego

11:30 am: **Commercialization of Nanotechnology: A Business Perspective**, Sean Murdock, Nano Business Alliance

Lunch Break

SESSION 5 Mon. 1:30 to 3:20 pm

Optical Measurements of Viscosity/Rheology

Chair: **Elliot L. Botvinick**, Beckman Laser Institute

Quantitative force calibration in viscoelastic media and living cells, K. Berg-Sørensen, Danmarks Tekniske Univ. (Denmark); M. Fischer, Danmarks Tekniske Univ. (Denmark) and Univ. of Copenhagen (Denmark); A. C. Richardson, N. Reihani, L. B. Oddershede, Niels Bohr Institute (Denmark) .. [6644-19]

Using optical traps to test materials by active microrheology (Invited Paper), C. F. Schmidt, D. Mizuno, Georg-August-Univ. (Germany) [6644-20]

Studying red blood cell agglutination by measuring membrane viscosity with optical tweezers, A. Fontes, H. P. Fernandes, A. A. de Thomaz, L. C. Barbosa, M. d. L. Barjas-Castro, C. L. César, Univ. Estadual de Campinas (Brazil) [6644-21]

Mechanical inhomogeneity and anisotropy in mimetic microtubule networks, J. Wang, Lehigh Univ.; Y. Liu, J. X. Tang, Brown Univ.; H. D. Ou-Yang, Lehigh Univ. .. [6644-22]

Microrheology of microlitre samples, S. J. W. Parkin, G. G. Knoener, T. A. Nieminen, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) [6644-23]

SESSION 6 Mon. 3:30 to 5:50 pm

Towards Lab-on-a-Chip

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

Micro-optics for optical trapping in microfluidics, F. Merenda, J. Rohner, J. R. Fournier, R. Salathé, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [6644-24]

Integrated optical manipulation within microfluidic systems, D. W. M. Marr, R. W. Applegate, Jr., J. A. Squier, Colorado School of Mines; T. Vestad, J. S. Oakey, Metafluidics, Inc. [6644-25]

Optically driven particle separation, W. Mu, Z. Li, L. Luan, Northwestern Univ.; G. Wang, Indiana Univ.-Purdue Univ. Fort Wayne; G. C. Spalding, Illinois Wesleyan Univ.; J. B. Ketterson, Northwestern Univ. [6644-26]

Transport and separation of microspheres with lensless imaging technique, Y. Sun, J. Bu, L. Ong, X. Yuan, Nanyang Technological Univ. (Singapore) [6644-27]

Dispersion of carbon nanotubes and nanotube-assisted bubble formation using near infrared optical tweezers, K. S. Mohanty, S. K. Mohanty, Univ. of California/Irvine [6644-28]

Optical microrotors: theory, design and fabrication, V. L. Y. Loke, T. Asavei, T. A. Nieminen, N. R. Heckenberg, H. H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) [6644-29]

Optically trapping lithoparticles of complex shapes: colloidal alphabet soup, J. N. Wilking, C. Hernandez, T. G. Mason, Univ. of California/Los Angeles [6644-30]

✓ Posters-Monday

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 Setup

Poster presenters may set up their posters between 10:00 am and 5:00 pm on Monday. Poster presenters who have not set up by 5:00 pm on Monday will be considered a "no show" and their manuscript will not be published. Presenters must remove their posters immediately after the poster session. Posters not removed will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session.

✓ **The use of laser tweezers to analyze sperm motility and mitochondrial respiration**, J. M. Nascimento, L. Z. Shi, C. Chandsawangbhuwana, Univ. of California/San Diego; B. S. Durrant, Conservation and Research for Endangered Species; E. L. Botvinick, M. W. Berns, Univ. of California/Irvine [6644-73]

✓ **Improved measurement of the maximum transverse force applicable by OT, using the viscous drag method**, A. C. Richardson, N. Reihani, L. B. Oddershede, Niels Bohr Institute (Denmark) [6644-74]

✓ **Improving axial optical trapping efficiency by compensating spherical aberrations**, N. Reihani, L. B. Oddershede, Niels Bohr Institute (Denmark) [6644-75]

✓ **A holographic tweezers setup for force measurements on biological molecules**, A. van der Horst, N. R. Forde, Simon Fraser Univ. (Canada) [6644-76]

✓ **Smooth-moving holographic optical-tweezers**, E. Eriksson, M. Goksor, Göteborg Univ. (Sweden); J. Leach, S. Keen, M. Padgett, Univ. of Glasgow (United Kingdom) [6644-77]

✓ **Diffraction optical elements for laser tweezers applications**, M. Nadasan, O. D. Iancu, Univ. Politehnica Bucuresti (Romania) [6644-78]

✓ **Forming standing vortex modes in opposite directed laser beams**, V. G. Shvedov, N. V. Shostka, V. Mykhaylov, Vernadskiy Tavricheskiy National Univ. (Ukraine) [6644-79]

✓ **Optical forces on asymmetric particles**, K. D. Bonin, D. Bonessi, Wake Forest Univ.; T. G. Walker, Univ. of Wisconsin/Madison [6644-80]

✓ **Laser cooling in flame synthesis of nanoparticles**, X. Liu, Rutgers Univ. [6644-81]

✓ **Flow-assisted collection of DNA molecules on silica beads**, R. Ramos-García, N. A. Korneev, J. C. Ramirez-Sanjuan, E. Rodríguez-Aboytes, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); M. Cardenas-García, Benemérita Univ. Autónoma de Puebla (Mexico) [6644-82]

✓ **Optofluidic microscope with optical tweezer actuation**, X. Heng, E. Hsiao, California Institute of Technology; D. Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland); C. Yang, California Institute of Technology [6644-83]

✓ **Micro-kinetics of the trapping of medium-sized particles: angular momentum transfer and force calibration**, Y. Zhao, J. S. Edgar, G. D. M. Jeffries, D. McGloin, D. T. Chiu, Univ. of Washington [6644-84]

Tuesday 28 August

SESSION 7 Tues. 8:00 to 10:00 am

Phun with Phase

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

Combining holographic optical tweezers with flexible image filtering (Invited Paper), M. A. Ritsch-Marte, A. Jesacher, C. Maurer, S. Bernet, Innsbruck Medical Univ. (Austria) [6644-31]

Encoding arbitrary grey-level optical landscapes for trapping and manipulation using GPC (Invited Paper), C. A. C. Alonzo, P. J. L. Rodrigo, I. R. Perch-Nielsen, J. S. Dam, J. Glückstad, Risø National Lab. (Denmark) [6644-32]

Optical coherence measurements of vortex light fields using optically manipulated micro-apertures, W. M. Lee, K. Dholakia, Univ. of St. Andrews (United Kingdom) [6644-33]

Rotating matter with optical and acoustical wavefields: new aspects of angular momentum transfer, K. P. Volk-Sepulveda, A. Orozco-Santillán, A. Vásquez-Arzo, N. Hernández-Candia, R. Jauregui, Univ. Nacional Autónoma de México (Mexico); V. M. Arrizón, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [6644-34]

Vortical laser tweezers with predetermined intensity structure, K. N. Afanasiev, E. G. Abramochkin, A. V. Korobtsov, S. P. Kotova, N. N. Losevsky, E. V. Razuvaeva, V. G. Volostnikov, P.N. Lebedev Physical Institute (Russia) [6644-35]

SESSION 8 Tues. 10:30 am to 12:00 pm

Basic Science

Chair: **Kristian Helmerson**, National Institute of Standards and Technology

All-optical manipulation and control of neutral atomic ensembles, W. T. Hill III, I. A. Arakelyan, N. Chattaripaban, S. Mitra, Univ. of Maryland/College Park [6644-36]

The world through a spinning window (Invited Paper), J. Leach, L. Allen, Univ. of Glasgow (United Kingdom); A. J. Wright, J. M. Girkin, S. M. Barnett, Univ. of Strathclyde (United Kingdom); M. J. Padgett, Univ. of Glasgow (United Kingdom) [6644-37]

Radiation pressure on submerged mirrors: implications for the momentum of light in dielectric media, M. Mansuripur, College of Optical Sciences/The Univ. of Arizona [6644-38]

Theories of longitudinal optical binding, E. M. Wright, College of Optical Sciences/The Univ. of Arizona; K. Metzger, M. Mazilu, K. Dholakia, Univ. of St. Andrews (United Kingdom); V. Karásek, P. Zemanek, Institute of Scientific Instruments (Czech Republic); P. Jakobsen, Univ. of Tromsø (Norway) [6644-39]

Lunch/Exhibition Break

SESSION 9 Tues. 1:30 to 3:10 pm

Optical Binding

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

Nonlinear optics perspective of optical binding of particles, E. M. Wright, College of Optical Sciences/The Univ. of Arizona; P. J. Reece, K. Metzger, K. Dholakia, Univ. of St. Andrews (United Kingdom) [6644-40]

Self-consistent collective dynamics and instability of an optically bound chain, H. Ritsch, Univ. Innsbruck (Austria) [6644-41]

Effect of coherence on transverse optical binding studied using line optical tweezers, S. K. Mohanty, Univ. of California/Irvine [6644-42]

Layer-by-layer optical assembly of colloidal particles, G. Wang, Indiana Univ.-Purdue Univ. Fort Wayne [6644-43]

A quantum electrodynamic understanding of optical binding, D. L. Andrews, R. G. Crisp, L. C. Dávila Romero, Univ. of East Anglia Norwich (United Kingdom) [6644-44]

SESSION 10 Tues. 3:30 to 6:00 pm

Plasmonics/Nano

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

Radiation forces and torques of surface plasmons excited by an optical beam with orbital angular momentum, G. Volpe, J. P. Staforelli, D. Petrov, Institut de Ciències Fotòniques (Spain) [6644-45]

Gold nanoparticles: enhanced optical trapping yet significant heating, T. T. Perkins, Y. Seol, A. E. Carpenter, Univ. of Colorado/Boulder [6644-46]

Thermal tweezers for nanomanipulation and nanofabrication on surfaces, D. K. Gramotnev, D. R. Mason, G. Gramotnev, Queensland Univ. of Technology (Australia) [6644-47]

Blue-detuned trap for resonant confinement of metal nanoparticles, M. Dienerowitz, P. J. Reece, N. K. Metzger, T. F. Krauss, K. Dholakia, Univ. of St. Andrews (United Kingdom) [6644-48]

Optical trapping of nanoshells, K. Helmerson, A. Crawford, B. Cranswick, R. B. Kishore, National Institute of Standards and Technology; N. J. Halas, C. Levin, Rice Univ. [6644-49]

Optical forces in nanoplasmonic systems for SERS, B. Sepulveda, F. Svedberg, Chalmers Tekniska Högskola (Sweden); Z. Li, H. Xu, Institute of Physics (China); M. Käll, Chalmers Tekniska Högskola (Sweden) [6644-50]

Plasmon-enhanced optical trapping of individual metal nanoparticles (Invited Paper), M. A. Pelton, Argonne National Lab.; M. Liu, The Univ. of Chicago; K. C. Toussaint, Jr., Univ. of Chicago; H. Y. Kim, G. Smith, J. Pestic, P. Guyot-Sionnest, The Univ. of Chicago; N. F. Scherer, Argonne National Lab. and The Univ. of Chicago [6644-51]

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Wednesday 29 August

SESSION 11 Wed. 8:10 to 10:10 am

Colloid Science with Optical Traps

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

Measuring many-body forces with many optical tweezers, S. Sainis, E. R. Dufresne, Yale Univ. [6644-52]

Multi-particle hydrodynamic interactions using a streaming high-speed video camera, J. Leach, Univ. of Glasgow (United Kingdom); R. Di Leonardo, G. Ruocco, Univ. degli Studi di Roma (Italy); C. Saunter, G. Love, Durham Univ. (United Kingdom); S. Keen, M. Padgett, Univ. of Glasgow (United Kingdom) [6644-53]

Direct observation of capillary forces between colloidal particles confined in a liquid film, F. Saglimbeni, R. Di Leonardo, G. Ruocco, Univ. degli Studi di Roma (Italy) [6644-54]

Studies of droplet manipulation in optical traps (Invited Paper), D. McGloin, D. R. Burnham, M. D. Summers, Univ. of St. Andrews (United Kingdom); N. Dewar, High School of Dundee (United Kingdom); J. Buchanan, D. Rudd, Univ. of St. Andrews (United Kingdom) [6644-55]

Parametric resonance of optically trapped aerosols (Invited Paper), R. Di Leonardo, G. Ruocco, Univ. degli Studi di Roma (Italy); J. Leach, M. J. Padgett, Univ. of Glasgow (United Kingdom); A. J. Wright, J. M. Girkin, Univ. of Strathclyde (United Kingdom); D. R. Burnham, D. McGloin, Univ. of St. Andrews (United Kingdom) [6644-56]

SESSION 12 Wed. 10:30 am to 12:10 pm

Optical Traps for Novel Sensors

Chair: Eric R. Dufresne, Yale Univ.

Circular motion control of an optically trapped microprobe for nano-position sensing, Y. Nagasaka, Y. Takaya, T. Hayashi, T. Miyoshi, Osaka Univ. (Japan) [6644-57]

Specific interaction study between protein molecules using optical tweezers and atomic force microscope combined, H. Sehgal, T. De, M. V. Salapaka, Iowa State Univ. [6644-58]

11:10 am: **Cavitation induced by continuous wave laser**, J. C. Ramirez-San-Juan, E. Rodriguez-Aboytes, N. A. Korneev, R. Ramos-García, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [6644-59]

Optical trapping on biological samples and its combination with other fields in optics, D. A. Cojoc, E. Ferrari, Lab. Nazionale TASC/INFN (Italy); V. Garbin, Univ. Twente (Netherlands); S. Cabrini, Lawrence Berkeley National Lab.; E. M. Di Fabrizio, Univ. degli studi Magna Græcia di Catanzaro (Italy) [6644-60]

Azimuthal trapping and optical binding observed in single fiber optical tweezers, S. K. Mohanty, K. S. Mohanty, Univ. of California/Irvine [6644-61]

Lunch/Exhibition Break

SESSION 13 Wed. 1:30 to 3:10 pm

The Optics of Optical Trap Systems

Chair: Rubén Ramos-García, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico)

Axial optical trapping for an arbitrary beam through a refractive index mismatch interface, A. A. R. Neves, Istituto Nazionale per la Fisica della Materia (Italy); A. Fontes, Federal Univ. of Pernambuco (Brazil); L. C. Barbosa, Univ. Estadual de Campinas (Brazil); A. Camoseo, R. Cingolani, D. Pisignano, Istituto Nazionale per la Fisica della Materia (Italy); C. L. César, Univ. Estadual de Campinas (Brazil) [6644-62]

Multiple counterpropagating-beam traps using MEMS-based spatial light modulation, P. J. L. Rodrigo, I. R. Perch-Nielsen, C. A. C. Alonzo, J. S. Dam, J. Glückstad, Risø National Lab. (Denmark) [6644-63]

Assembly of novel nano and micro-structures, D. M. Carberry, L. Ikin, Univ. of Bristol (United Kingdom); G. M. Gibson, M. J. Padgett, Univ. of Glasgow (United Kingdom); M. J. Miles, Univ. of Bristol (United Kingdom) [6644-64]

Operation of high resolution optically addressed spatial light modulators, D. Preece, E. Yao, G. M. Gibson, M. Padgett, Univ. of Glasgow (United Kingdom) [6644-65]

Study on femtosecond optical tweezers induced kerr effect on rotation of microscopic objects, S. K. Mohanty, Univ. of California/Irvine; K. D. Rao, P. K. Gupta, Raja Ramanna Ctr. for Advanced Technology (India) [6644-66]

SESSION 14 Wed. 3:30 to 5:30 pm

Optical Control for Biological Studies

Chair: David W. M. Marr, Colorado School of Mines

Preparative separations using optical chromatography, A. V. Terray, J. Arnold, T. A. Leski, S. D. Sundbeck, S. J. Hart, Naval Research Lab. [6644-67]

Interrogating the impact of optical trapping on the bioluminescence of individual cells using the marine bacterium *Vibrio harveyi*, B. Koss, Naval Research Lab. [6644-68]

Elastic force measurement for *Klebsiella pneumoniae* type III pili by using optical tweezers, F. Chen, L. Hsu, National Chiao Tung Univ. (Taiwan) [6644-69]

Stable manipulating of microscopic rods by line optical tweezers with haptic feedback, S. Lee, Y. Lee, Kwangju Institute of Science and Technology (South Korea) [6644-70]

Feedback control single particle tracking system, A. Chang, National Chiao Tung Univ. (Taiwan) [6644-71]

Real-time control of optical tweezers, A. E. Wallin, R. Tuma, Univ. of Helsinki (Finland) [6644-72]

Courses of Related Interest

See pages 162-187 for full course descriptions.

SC496 Fabrication and Processing of Nanostructures (Cao) Sunday 26, 8:30 am - 5:30 pm

SC497 Nanophotonics (Prasad) Sunday 26, 1:30 - 5:30 pm

SC655 Introduction to Optical Tweezers and Optical Micromanipulation (Dholakia, Spalding) Thursday 30, 8:30 am - 12:30 pm