Advance Program

Advanced Nanobiophotonics

Monday, 21 July 2008

ALL SESSIONS WILL BE HELD IN PIRAMIDE III

13.30 - 14.45

Session MB1: NANOBIOSENSING
Session Chair: Ilko K. Ilev, *US Food and Drug Administration, Rockville, MD, USA*

MB1.1 13.30 - 14.00 (Invited)
Nanosensors and Nanoprobes for Environmental Health Sensing and Biomedical Screening, T. Vo-Dinh, *Duke University, Durham, NC, USA*

This presentation describes the development and applications of fiberoptics nanosensors and plasmonics nanoprobes for environmental health sensing, biomedical diagnostics and high throughput screening. Plasmonics refers to the research area of enhanced electromagnetic properties of metallic nanostructures.

MB1.2 14.00 - 14.30 (Invited)

Quantitative Label-Free High Throughput Proteim Arrays, M. Unlu, I. E. Ozkumur, J. Needham, D. A. Bergstein and B. B. Goldberg, *Boston University, Boston, MA, USA*

Direct monitoring of primary molecular binding interactions without the need for secondary reactants would markedly simplify and expanded applications of high-throughput label-free detection methods. A simple interferometric technique is presented that monitors the optical phase difference resulting from accumulated biomolecular mass.

MB1.3 14.30 - 14.45

Computational Design of FIB-Milled Nanostructures for use in Biosensing, M. D. Gerhold, A. Dhawan, *US Army Research Laboratory, Research Triangle Park, NC, USA* and T. Vo-Dinh, *Duke University, Durham, NC, USA*

Finite difference time domain analysis was carried out on metallic nanostructures of varying size and shape with incident laser radiation. SERS spectra with known dyes were taken on focus ion beam milled silver and gold nanostructures for comparison with computed field enhancements.

15.00 - 15.30 **COFFEE BREAK**

15.30 - 16.45

Session MB2: SINGLE CELL NANODETECTION IN VIVO
Session Chair: Tuan Vo-Dinh, *Duke University, Durham, NC, USA*

MB2.1 15.30 - 16.00 (Invited)
Photothermal Detection and Tracking of Individual Non-Fluorescent Nano-Objects in Live Cells, L. Cognet, V. Octeau, D. Lasne, S. Berciaud and B. Lounis, *Université Bordeaux 1, Talence Cedex, France*

To overcome the photobleaching problem inherent to fluorescence techniques we recently developed a new optical detection method for individual non-fluorescent nano-objects. It allows detecting the movement of individual membrane proteins labeled with 5nm gold nanoparticles in living cells for arbitrary long times.

MB2.2 16.00 - 16.30 (Invited)

Single Particle Spectroscopy and Tracking of Gold Nanospheres in Living Cells by Conforcal Light Scattering Microscopy, T. Asahi, *Osaka University, Suita, Osaka, Japan*, T. Uwada, *National Chiao Tung University, Hsinchu, Taiwan,* G. Louit, *Osaka University, Suita, Osaka, Japan* and H. Masuhara, *National Chiao Tung University, Hsinchu, Taiwan.*

Single particle spectroscopy of gold nanoparticles in living cells by a scanning conforcal light scattering microspectroscopic system is demonstrated. Potential applications of single gold nanoaprticle plasmon spectroscopy to biophotonics are discussed.

MB2.3 16.30 - 16.45

Monitoring Spontaneous Electrical Activity in Cultured Neural Networks using Vertically Aligned Nanotube Arrays, R. A. Seger, E. de Asis, W.-K. Wong, L. Wong, J. Hieb, C. Yang and M. S. Isaacson, *University of California - Santa Cruz, Santa Cruz, CA, USA*

We present the electrical monitoring of cultured living neural cells using vertically aligned carbon nanotubes (CNT) as an extracellular electrode material in a microelectrode array (MEA).

Tuesday, 22 July 2008

09.00 - 10.00

Session TuB1: Nanoparticle-Enhanced Diagnostics
Session Chair: M. Selim Unlu, *Boston University, Boston, MA, USA*

TuB1.1 09.00 - 09.30 (Invited)
Immunotargeted Gold Nanoshells as Contrast Agents for Cell Surface Biomarkers Using Nonlinear Excitation Microscopy, J. Sun, L. Bickford, K. Fu, N. Lewinski, V. Nammalvar, J. Chang and R. Drezek, *Rice University, Houston, TX, USA*

We demonstrate the use of immunotargeted gold nanoshells as contrast agents for in vitro two-photon microscopy. Results indicate that under near-infrared excitation, immunotargeted nanoshells provide superior contrast of live breast cancer cells over normal cells.

TuB1.2 09.30 - 10.00 (Invited)

Microscopy of Gold Nanoshells in Tumors Using Two-Photon Induced Photoluminescence, J. Park, A. Estrada, *University of Texas at Austin, Austin, TX, USA*, K. Sharp, K. Sang, J. Wang, J. Schwartz, C. Coleman, J. D. Payne, *Nanospectra Biosciences Inc., Houston, TX, USA*, A. Dunn and J. W. Tunnell, *University of Texas at Austin, Austin, TX, USA*

We report the nonlinear photo-physical properties of silica/gold nanoshells (NS) and demonstrate their application as biological imaging agents. We present images of the microscopic distribution of nanoshells in murine tumors using NIR laser scanning multi-photon microscopy.

10.00 - 10.30 COFFEE BREAK

10.30 - 11.45

Session TuB2: Nanorods and Single Cell Manipulation
Session Chair: Jordan M. Gerton, *University of Utah, Salt Lake City, UT, USA*

TuB2.1 10.30 - 11.00 (Invited)
Observation of Narrow Spectral Linewidths from Single Gold Nanorods, L. Qiu, *Harvard University, Boston, MA, USA*, T. A. Larson, D. K. Smith, *University of Texas at Austin, Austin, TX, USA*, E. Vitkin, I. Itzkan, E. B. Hanlon, *Harvard University, Boston, MA, USA*, B. A. Korgel, *University of Texas at Austin, Austin, TX, USA*, L. T. Perelman, *Harvard University, Boston, MA, USA* and K. Sokolov, *University of Texas at Austin, Austin, TX, USA*

Nanorods have the potential to be employed as bright molecular biomedical labels. However, nanorod samples usually exhibit relatively wide spectral lines. Using CLASS microscopy we found that single gold nanorods have a narrow spectrum.

TuB2.2 11.00 - 11.30 (Invited)

Enhanced Optical Micromanipulation and Transfection of Cells using Femtosecond Lasers, T. Brown, X. Tsampoula, D. Stevenson, C. McDougall, F. J. Gunn-Moore and K. Dholakia, *University of St. Andrews, St. Andrews, UK*

We show that by considering both spatial and temporal modes of femtosecond laser operation, the range of options available for applications in optical transfection can be greatly enhanced.

TuB2.3 11.30 - 11.45

Optical Properties of a New Inorganic Liquid Crystal, J. Ramella-Roman and O. C. Wilson, *Catholic University of America, Washington, DC, USA*

We measured the optical properties of a new inorganic liquid crystal material. By changing the synthesization process AlFe colloidal rods approximately 200-400 nm in length and ellipsoidal platelets 2000-5000 nm in diameter can be created.

12.00 - 13.30 LUNCH BREAK

13.30 - 14.45

Session TuB3: Advanced Biophotonics Nanoscopy
Session Chair: James W. Tunnell, *University of Texas at Austin, Austin, TX, USA*

TuB3.1 13.30 - 14.00 (Invited)

Developments in Fluorescence Nanoscopy, A. Egner*, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany*

The resolution of conventional light microscopy is limited by diffraction. Optical switching events allow one to circumvent this limit. New developments in methods using ensemble and single molecule switching will be presented.

TuB3.2 14.00 - 14.30 (Invited)

Nanoscale Fluorescence Microscopy with Carbon Nanotubes, C. Mu, B. D. Mangum, E. Shafran and J. M. Gerton*, University of Utah, Salt Lake City, UT, USA*

We demonstrate the use of single-walled carbon nanotubes as nano-optical probes in apertureless near-field fluorescence microscopy. The carbon nanotubes strongly quench fluorescence leading to near-field contrast with spatial resolution of ~20 nm.

TuB3.3 14.30 - 14.45

High Resolution Three-Dimensional Reconstruction of Photonic Crystal Structure found in Beetle Scales, J. W. Galusha, L. R. Richey and M. H. Bartl*, University of Utah, Salt Lake City, UT, USA*

In this paper we demonstrate how sequential FIB milling combined with scanning electron microscopy imaging can be used to achieve a previously unprecedented high-resolution 3D reconstruction of the photonic crystal structure found in beetle scales.

15.00 - 15.30 COFFEE BREAK

15.30 - 16.45

Session TuB4: Sub-Diffraction Nanoscale Imaging
Session Chair: Lev T. Perelman, *Harvard University, Boston, MA, USA*

TuB4.1 15.30 - 16.00 (Invited)
Plasmon Imaging with Sub-Diffraction Resolution, I. Smolyaninov*, BAE Systems, Nashua, NH, USA*

Two-dimensional optics of surface plasmon polaritons may be used to achieve far-field super-resolution imaging. Regular plasmonic lenses and negative index "superlenses" may be used in the imaging experiments.

TuB4.2 16.00 - 16.30 (Invited)

Nanobiophotonics: Breaking the Diffraction Barrier in the Subwavelength Nanoscale, I. K. Ilev, D.-H. Kim*, US Food and Drug Administration, Silver Spring, MD, USA* and A. H. Gandjbakhche*, National Institutes of Health, Bethesda, MD, USA*

We present a novel approach for ultrahigh depth-resolution (≤ 2 nm) confocal microscopy beyond the diffraction barrier in the subwavelength nanometric range (below 100 nm), which is based on a simple fiber-optic confocal design.

TuB4.3 16.30 - 16.45

Near-field Scanning Optical Nanoscopy - Breaking the Diffraction Limit Using Nano Light Emitting Probe Tip, J. X. J. Zhang*, University of Texas at Austin, Austin, TX, USA*

We describe optical and topographic imaging using a nanoscale light emitting diode (a silicon dioxide layer buried between a phosphorus-doped N+ silicon layer and a gallium-doped P+ silicon region) monolithically integrated on a silicon probe tip for near-field scanning optical nanoscopy.

End of Program