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Nanoparticles in Biology

**Optical Biochips and Biosensors for
Nucleic Acids and Proteins**

Photonics in Medicine

Imaging Systems for Information Acquisition

Nonlinear Optics

Photonic Devices

**Optical Communication Systems
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12-14 September 2005
Toronto Congress Centre
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A regional symposium focused on Canadian and international business and technology innovations in optics and photonics

Plan now to participate!

On behalf of the organising and programme committees I am pleased to invite you to attend Photonics North 2005 taking place next September in Toronto, Canada. Both Toronto and the southern Ontario region have a long association with research and development in Photonics, the area includes some of Canada's best-known universities – Toronto, Waterloo and McMaster – and it plays host to several major R&D firms. Also, autumn weather in Ontario is pleasant and our lovely city is a major tourist destination with a great deal to see and to do.

The technical sessions for 2005 reflect the growing diversity of photonics research. In recent years the focus has moved from telecommunications to a much broader range, including: nanotechnology, biophotonics, optical sensing, chip scale interconnections, et cetera. This year's programme includes sessions that reflect this diversity and the growing breadth of our field.

In the biomedical area we have included sessions on: Nanoparticles in Biology, Optical Biochips and Biosensors for Nucleic Acids, Photonics in Medicine, and Imaging Systems for Information Acquisition. The combination of applied science and optical engineering has resulted in many key advances in the areas of telecommunications and computing that will be addressed in sessions on: Nonlinear Optics, Photonic Devices, Optical Communications Systems and Networks, Nanophotonics, and Microwave Photonics.

So let me reiterate my invitation to all researchers, scientists, engineers, applications and product developers, educators and business people, please join us in Toronto in September 2005.



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British Columbia Photonics Industry Association

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INO

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In Cooperation with



Nanoparticles in Biology (PN01)

Conference Chairs: **Warren C. W. Chan**, Univ. of Toronto (Canada); **Kui Yu**, National Research Council Canada (Canada)

The last several years have seen rapid progress in the development of colloidal quantum dots for biological applications, with Science Magazine naming quantum-dot bioimaging technology among the top 10 scientific breakthroughs of 2003. The unique electronic, magnetic and optical properties of colloidal particles such as quantum dots, surface enhanced Raman (SERs) particles and resonant light scattering particles (RLS) make them ideal probes for a large assortment of biological applications, such as cellular microscopy, flow cytometry, DNA and protein chips, histology, cancer detection, single molecule fluorescence detection, and correlation spectroscopy. Quantum dots possess narrow emission linewidths, high fluorescence quantum yields, and essentially no photobleaching, making them ideal for fluorescence applications that require detection of multiple signals. The rapid development of these particles has required strong collaboration of scientists in physics, chemistry and biology.

Papers are solicited in all areas of Nanoparticles in Biology, in particular on:

- synthesis and characterisation techniques
- near-IR quantum dots, resonant scattering particles, and surface enhanced particles
- bioconjugation and biolabelling chemistry
- measurement techniques such as microscopy, spectroscopy, AFM, SFM, et cetera
- applications in microscopy and cellular imaging/processes
- molecular and in vivo imaging
- applications in regenerative medicine
- medical applications in immuno-fluorescence assays, delivery and screening.

Optical Biochips and Biosensors for Nucleic Acids and Proteins (PN02)

Conference Chair: **Ulrich J. Krull**, Univ. of Toronto (Canada)

Sensor technologies can be classified as either biosensors that are selective for one or a few targets, or arrays that can be used for concurrent analysis of many parallel-binding reactions. Array technologies have become very popular due to information content, and are particularly powerful in problems that involve large-scale screening. Commonly, prior to identification using microarray technologies, targets are fluorescently labeled. A spatially resolved binding pattern as determined by fluorescence microscopy can be used to identify the presence of the target molecules. Numerous approaches for development of microarray technologies have been introduced. These include the use of lithography for immobilization of probe molecules, electrochemical manipulation of spots or pads of probe molecules, and the use of fiber optic bundles that are altered so that each fiber terminus can house an addressable microbead that can interact with targets. Limitations inherent in such approaches can include complexity in preparation of sensor arrays, limited control of the quality of immobilization across spots or beads, the difficulty of identification of stringency that is concurrently suitable for optimization of binding at each and every spot or bead, and the sensitivity that can be achieved in the absence of use of amplification methods.

Papers are solicited in all areas of Optical Biochips and Biosensors for Nucleic Acids and Proteins, in particular on:

- design of array technologies
- analysis of data from microarrays that target nucleic acids and peptides/proteins
- integration of optical sensor technologies with microfluidic sample handling and delivery methods
- applications in high throughput screening
- new instrumental designs and methods to achieve high sensitivity
- schemes that have potential to eliminate the need for PCR amplification.

Photonics in Medicine (PN03)

Conference Chairs: **Brian C. Wilson**, **Robert A. Weersink**, Univ. Health Network (Canada)

Photomedicine applies optical techniques for the non-invasive or minimally invasive diagnosis and treatment of disease. Examples of therapeutic techniques include photodynamic therapy, photothermal therapy, and image-guided surgery. Photodynamic therapy has been approved by health agencies for several indications such as lung, bladder, melanomas, and age-related macular degeneration and is currently in clinical trials for sites, including the prostate. Photothermal techniques deliver high intensity light to induce hyperthermia in tissue volumes that lead to coagulation. Surgical guidance using optical techniques include imaging of differential fluorescence signals from benign and diseased tissue, typically with the aid of a contrast agent.

For diagnostics, optical techniques open the possibility of non-invasive "optical biopsy", i.e. techniques that seek to find early stage disease and to minimize the need for extensive biopsies. These techniques differentiate benign from malignant tissue on the basis of tissue morphology, and/or chemical composition. Fluorescence techniques exploit either difference in autofluorescence or use contrast agents to differentiate disease.

Papers are solicited in all areas of Photonics in Medicine, in particular on:

- light and drug Dosimetry in photodynamic therapy
- treatment planning in photodynamic therapy and photothermal therapy
- cellular, vascular, effects of PDT
- instrumentation for light delivery, tissue monitoring, treatment monitoring during therapies
- in vitro, pre-clinical, clinical studies of PDT, PTT, photoablative, and low level laser therapy
- applications of photomedicine in treatment of cancer, infections, et cetera
- techniques, instrumentation, and probes for image guided-surgery
- ophthalmology techniques including the use of adaptive optics, wavefront sensing, PDT for macular degeneration
- optical biopsy techniques
- diffuse optical tomography
- Raman, fluorescence and diffuse reflectance/transmittance spectroscopy
- methods for measuring tissue optical properties
- optical coherence tomography for endoscopic and ophthalmic indications.

Special Event

International Photonics Forum

Join us to discuss opportunities for research and industrial partnerships with the selected country. Proposed topics include research collaborations, business partnerships, investment opportunities, advances in biophotonics, automotive applications and international intellectual property issues.

Call for Papers

Imaging Systems for Information Acquisition (PN04)

Conference Chair: **Richard Hornsey**, York Univ. (Canada)

Co-Chairs: **Robert Allison**, York Univ. (Canada); **Leonard MacEachern**, Carleton Univ. (Canada)

As imaging technologies become more widely available, applications in which image-based information is the primary system output are set to proliferate. In this paradigm, the image is an intermediate step towards extracting, or modifying, scene information. The resulting systems can include image acquisition, image processing, information extraction, functional control and feedback, human interface and display, and communication or sharing of image-based information. In these broader areas of application, non-traditional system architectures may represent the optimal solutions.

Papers are solicited in all areas of Imaging Systems for Information Acquisition, in particular on:

- biologically inspired imaging systems
- sensor-human systems for virtual environments, augmented reality, vision rehabilitation
- distributed sensors, sensor networks and swarms
- intelligent sensor systems
- digital imaging and image processing
- image sensors and camera systems
- sensor process technology
- image transmission technology
- high speed imaging
- real time imaging and processing
- 3D imaging and displays
- imaging technologies for biological and medical applications
- display technologies
- non-visible imaging
- novel imaging and display technologies or applications.

Nonlinear Optics (PN05)

Conference Chair: **Roberto A. Morandotti**, INRS-EMT/Univ. du Québec (Canada)

Cochair: **José Azaña**, INRS-EMT/Univ. du Québec (Canada)

Nonlinear optics is a term used to cover the broad range of phenomena that arise when a high intensity optical beam changes the properties of a material. Current areas of research interest range from fundamental light-matter interactions, the development of new materials, the application of nonlinear optics for all-optical processing and switching devices, nonlinear microscopy and enhanced three dimensional lithography. This conference will act as a forum for the presentation of recent advances in the area of nonlinear optics.

Papers are solicited in all areas of Nonlinear Optics, in particular on:

- nonlinear guided waves
- high intensity light matter interactions
- nonlinear materials (organics, semiconductors, chalcogenide glasses)
- applications of nonlinear optics (wavelength conversion, all-optical switching and soliton propagation)
- nonlinear microscopy
- Raman interactions
- nonlinear magneto optical effects.
- nanostructured material for nonlinear optics.

Photonic Devices (PN06)

Conference Chair: **Peter Mascher**, McMaster Univ. (Canada)

This conference will address issues related to the design and fabrication of photonic devices for a broad range of applications. Special emphasis will be put on the materials science for novel devices and the development of advanced fabrication technologies.

Papers are solicited in all areas of Photonic Devices, in particular on:

- fundamental aspects of photon-solid interaction relevant to micro-nano-scale processes
- novel materials for long-wavelength photonic devices (antimonides, CdTe)
- laser micromachining technologies
- advanced deposition technologies, including laser-based deposition (nanocrystals, single-wall carbon nanotubes, PLD)
- photo-assisted microfabrication processes
- micro-nano patterning (photo-etching, doping and annealing)
- photon-based hybrid techniques
- materials processing for microphotonic devices
- materials related challenges in MEMS/MOEMS (stress, charging, fatigue, stiction)
- micro material removal/machining for optics
- actuation methods for MEMS/MOEMS based optics.

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Optical Communication Systems and Networks (PN07)

Conference Chairs: **John C. Cartledge**, Queen's Univ. (Canada); **David V. Plant**, McGill Univ. (Canada)

Optical communications technology is widely used in (i) telecommunication networks for metro access, metro core, long haul and ultra-long haul applications, (ii) data communication systems, and (iii) analog systems. Novel enabling technologies continue to provide increased functionality and improved levels of system/network performance. This conference focuses on the modeling, analysis, design, and implementation of optical communication systems and networks.

Papers are solicited in all areas of Optical Communication Systems and Networks, in particular on:

- transmission/WDM system modeling and experiments
- impact of transmission impairments
- adaptive impairment compensation (optical and electrical)
- modulation formats and techniques
- forward error correction
- transmitter and receivers
- network elements
- multiplexing and demultiplexing
- cross-connects and add-drop multiplexers
- gain-equalization
- optical parameter and performance monitoring
- all-optical regeneration, demultiplexing, clock recovery, and data rate conversion
- analog systems, video systems, subcarrier multiplexing
- free-space systems
- network architecture and performance
- algorithms and protocols
- network protection and restoration
- network control and management
- networking impact of switching technology
- optical access systems (PONS, optical Ethernet)
- hybrid wireless-optical networks
- optical packet switching/optical burst switching
- multiple access techniques
- network requirements, design and planning, management
- system/network reliability and availability.

Nanophotonics (PN08)

Conference Chair: **Harry Ruda**, Univ. of Toronto (Canada)

Nanotechnology is having a major impact across a range of technologies including photonics. The ability to structure materials on the nanoscale offers the ability to engineering the optical properties of the final material.

Papers are solicited in all areas of Nanophotonics, in particular on:

- photonic band gap materials and photonic crystals
- metamaterials and left-handed materials
- nanoscale organic and inorganic materials including:
 - quantum well, quantum dash and quantum dot materials
 - carbon nanotubes
 - metallic nano structures and surface plasmons
- new simulation techniques for nanoscale photonic materials
- novel nano-fabrication techniques.

Microwave Photonics (PN09)

Conference Chair: **Jianping Yao**, Univ. of Ottawa (Canada)

The wideband, low loss transmission capability of optical fibre links has led to an ever-increasing interest in their use for the distribution, control and processing of microwave and millimeter-wave signals in applications such as optically controlled phased array antennas, fibre-fed wireless and cellular radio systems (radio-over-fibre), optical processing of microwave and millimeter-wave signals, and wideband cable television distribution. Photonics also brings new functions to microwaves such as long delay lines, spectrum analysis, frequency conversion, optical control of microwave devices, high performance oscillators, and ultra-fast analog-to-digital converters. This conference will act as a forum for researchers to present their research results in the area of microwave photonics.

Papers are solicited in all areas of Microwave Photonics, in particular on:

- high-speed and broadband photonic devices for microwave photonics applications: lasers, detectors, modulators, amplifiers, switches, et cetera
- optically controlled phased array antennas
- high-speed optical analog-to-digital conversion
- fibre-fed wireless and cellular radio systems and networks
- sub-carrier multiplexed and CATV systems
- optical generation of microwave and millimeter-wave signals
- all-optical processing of microwave and millimeter-wave signals
- optical control of microwave devices
- microwave photonic device, circuit and system modeling
- novel microwave photonic systems and applications.

IMPORTANT DATES!

Abstract Due Date:
28 March 2005

Final Summary Due Date:
11 July 2005

Manuscript Due Date:
15 August 2005

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, and present the papers either orally or in poster format.

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Please contact your travel agent to obtain current information about passport and visa requirements.

Advance Technical Programme

Available June 2005

The comprehensive Advance Technical Programme for this symposium will list conferences, paper titles, and authors in order of presentation, an outline of all planned special events, and information detailing the hotel reservations process. All those who submit an abstract will receive a copy, or contact SPIE to request a copy.

Clearance Information

If government and/or company clearance is required to present and publish your presentation, start the process now to ensure that you receive clearance if your paper is accepted.

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This programme is based on commitments received up to the time of publication and is subject to change without notice.

SPIE would like to express its deepest appreciation to the symposium chairs, conference chairs, programme committees, and session chairs who have so generously given of their time and advice to make this symposium possible. The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members.

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Manuscript Due Date: **15 August 2005**

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Submissions imply the intent of at least one author to register, attend the symposium, present the paper (either orally or in poster format), and submit a full-length manuscript for publication in the conference Proceedings.

All authors (including invited or solicited speakers), programme committee members, and session chairs are responsible for registering and paying the reduced author, session chair, programme committee registration fee.

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1. **PAPER TITLE**
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 - Last (family) Name
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3. **PRESENTATION PREFERENCE** "Oral Presentation" or "Poster Presentation."
4. **PRINCIPAL AUTHOR'S BIOGRAPHY** Approximately 50 words.
5. **ABSTRACT TEXT** Approximately 250 words.
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