

Program

2nd International Symposium

Frontiers in Neurophotonics

22-24 September 2010

Venue: Hotel Chateau Laurier, Quebec City, Canada

*This **second edition of Frontiers in Neurophotonics** is organized jointly by the **University of Bordeaux** and **Laval University** to foster scientific exchanges between Neurobiologists and Physicists sharing interest in Biophotonics.*



BIOPHOTONICS
week **IN QUEBEC**

www.biophotonicsworld.org/biophotonicsweek

22.09 - 30.09 | 2010

Quebec City

Message from the Organizing Committee



Welcome to Biophotonics Week in Quebec. This is a unique confluence under one umbrella (or should I say, “sous un parapluie”) of four international conferences (and a 5th affiliated conference) plus a graduate school, all focused on different aspects of the emerging field of biophotonics - the application of optical sciences and technologies to the life science and clinical medicine. The setting is physically beautiful and culturally sophisticated, the science promises to be exciting, and the opportunities for interdisciplinary and intersectorial networking will be unparalleled. On behalf of all the conference Chairs, co-Chairs and organizers, I would like to thank the many partners (industry, government and private), both

of BPW overall and of the individual events, and the hardworking and skilled staff at the Canadian Institute for Photonic Innovations for boundless energy and administrative support.

This event will not, likely, happen again in this format, but we all hope and expect that the individual meetings will go from strength to strength as they are held in subsequent years in different locations around the globe. Biophotonics has huge potential for socioeconomic and health care impact, both in advanced and developing countries, and all participants at Biophotonics Week should take pride in their contribution to advancing the field.

Enjoy the events, enjoy the hospitality of Quebec and Canada.

Brian C. Wilson
University of Toronto / University Health Network
Chair, Biophotonics Week in Quebec

2nd International Symposium **Frontiers** in Neurophotonics

Message from the Conference's Chair



Welcome to *Frontiers in Neurophotonics*. This international symposium is organized jointly by the University of Bordeaux and Laval University to foster scientific exchanges between Neurobiologists and Physicists sharing interest in developments of leading-edge photonics-based approaches to understand and manipulate the nervous system, from its individual molecular components to complex networks in the intact brain.

Indeed, advances in understanding cell function critically depend on our capacity to improve our resolution of dynamic molecular mechanisms and the availability of the appropriate tools to study these events in live cells and intact tissue. This is particularly true in the field of Neurosciences where challenges in spatial and temporal resolution are pushed to the extreme. These challenges include: breaking the diffraction limits of light to follow molecular events in submicron scale dendritic spines or to understand the mechanics of neurotransmitter release in synaptic terminals; following the spatiotemporal dynamics of signalling proteins on highly fluid membranes; developing novel probes to detect enzyme activity in real time *in situ*; recording virtually simultaneously the activity of multiple nerve cells, at millisecond time scales, within a large area to decipher network interactions; probing deeper and deeper into the brain; monitoring intrinsic cellular events at high resolution with minimal invasiveness in intact animals; achieving label-free chemical imaging in live tissue and exploiting light to control neuronal activity in specific brain nuclei in freely moving animals.

These transdisciplinary challenges and many others will be addressed at this meeting. It will be a great opportunity to foster new collaborations to undertake novel challenges that will push further our ability to detect, measure, manipulate and follow the intricate components of neuronal function. This is key to understanding brain function in health and disease and thus to increase our ability to design novel treatments for neurological and psychiatric disorders.

Following up on the highly successful first meeting in Bordeaux in 2008, the second edition is taking place in Quebec City, the historical French gateway to North America.

We hope you enjoy the meeting! Bienvenue à tous!



Yves De Koninck

Université Laval / Centre de recherche Université Laval Robert-Giffard
Chair, Frontiers in Neurophotonics

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Tuesday 21.09.2010

18:00 -	Opening reception (Hotel Château Laurier)
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Wednesday 22.09.2010

7:30 - 8:30	Breakfast
8:30 - 12:00	Chairman: Paul De Koninck
8:30 - 9:00	Ed Ruthazer (McGill University, Montréal, Canada) <i>The interplay between synapses and structure in the developing visual system</i>
9:00 - 9:30	David Bensimon (ENS, Paris, France) <i>Photocontrol of protein activity in live cells</i>
9:30 - 10:00	Haruhiko Bito (University of Tokyo, Japan) <i>Dual FRET-based analysis of biochemical computation performed by neuronal Ca²⁺ signaling processes</i>
10:00 - 10:30	Health Break
10:30 - 11:00	Thomas Knopfel (RIKEN, Tokyo, Japan) <i>Imaging brain electric signals with genetically-targeted voltage-sensitive fluorescent proteins</i>
11:00 - 11:30	Horst Vogel (EPFL, Lausanne, Switzerland) <i>Conformational diffusion from ligand binding to channel gating in the nicotinic acetylcholine receptor</i>
11:30 - 12:00	Daniel Côté (Université Laval, Québec, Canada) <i>In-vivo imaging of demyelinating disorders</i>
12:00 - 14:00	Lunch and Poster session
14:00 - 17:30	Chairman: Daniel Côté
14:00 - 14:30	Daniel Choquet (Université de Bordeaux, France) <i>Mechanism of activity dependent AMPAR stabilization at synapses</i>
14:30 - 15:00	Tim Murphy (UBC, Vancouver, Canada) <i>Imaging and optogenetic tools for studying cortical circuit structure and function in healthy brain and after stroke</i>
15:00 - 15:30	Peter Saggau (Baylor College of Medicine, Houston, USA) <i>Advanced NeuroImaging with Diffractive Optical Elements</i>
15:30 - 16:00	Health Break

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16:00 - 16:30	Valentina Emiliani (Paris Descartes, France) <i>Two photon patterned photoactivation by spatiotemporal shaping of ultra-short pulses</i>
16:30 - 17:00	Rainer Freidrich (Freidrich Miescher Institute, Basel, Switzerland) <i>Optophysiological dissection of neuronal circuit function in the zebrafish olfactory system</i>
17:00 - 17:30	Enrico Gratton (Univ. of California, Irvine, USA) <i>Measuring anisotropic diffusion in cell using the pair correlation function approach</i>
17:30 - 19:00	Poster session

Thursday 23.09.2010

7:30 - 8:30	Breakfast
8:30 - 12:00	Chairman: Paul Wiseman
8:30 - 9:00	Irene Kochevar (Harvard Medical School, Boston, USA) <i>Reconnecting nerves using photochemistry</i>
9:00 - 9:30	Mark Bates (Max Planck Institute, Göttingen, Germany) <i>Super-resolution optical imaging of neuron structure and connectivity</i>
9:30 - 10:00	Brian MacVicar (UBC, Vancouver, Canada) <i>Regulation of cerebral blood vessels and neuronal activity by astrocytes revealed by two photon uncaging and imaging</i>
10:00 - 10:30	Health Break
10:30 - 11:00	Valentin Nägerl (Université de Bordeaux, France) <i>Nanoscale imaging of living synapses by STED microscopy</i>
11:00 - 11:30	Thomas Oertner (Freidrich Miescher Institute, Basel, Switzerland) <i>Spine calcium transients and synaptic plasticity</i>
11:30 - 11:45	Lisa Topolnik (Université Laval, Québec, Canada) <i>Cell-type-specific and activity-dependent dynamics of Ca²⁺ signals in dendrites of hippocampal inhibitory interneurons</i>
11:45 - 12:00	Kostadinka Bizheva (University of Waterloo, Ontario, Canada) <i>In-vivo, simultaneous imaging of retinal structure and function with a combined Electroretinography and Ultrahigh Resolution Optical Coherence Tomography system</i>
12:00 - 14:00	Lunch and Poster session

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14:00 - 17:30	Chairman: Daniel Choquet
14:00 - 14:30	Joseph Culver (Washington Univ. in St-Louis, USA) <i>High density diffuse optical tomography for mapping visual cortex activity</i>
14:30 - 15:00	Thomas Blanpied (University of Maryland School of Medicine, Baltimore, USA) <i>Single-molecule tracking to map the dynamic interior of dendritic spines</i>
15:00 - 15:30	Health Break
15:30 - 16:00	Jeff Squier (Colorado School of Mines, Golden, USA) <i>Wide-field imaging and manipulating neuronal tissue with femtosecond laser pulses</i>
16:00 - 17:00	Richard W. Tsien (Keynote speaker) (Stanford University, USA) <i>Neurophotonic approaches to motion, fusion and recycling of synaptic vesicles</i>
17:00 - 19:00	Poster session
19:00 -	Departure to Banquet and PHOTON of the Opera Show (Chapelle du Musée de l'Amérique française) See last page for directions

Friday 24.09.2010

7:30 - 8:30	Breakfast
8:30 - 12:00	Chairman: Laurent Groc
8:30 - 9:00	Ryohei Yasuda (Duke University, Durham, USA) <i>Postsynaptic signaling mechanisms underlying functional and structural plasticity of dendritic spines</i>
9:00 - 9:30	Francisco Bezanilla (University of Chicago, USA) <i>Conformational changes in ion channels detected by fluorescence</i>
9:30 - 10:00	Paul Wiseman (McGill University, Montréal, Canada) <i>Deciphering synaptic receptor distributions and clustering using spatial intensity distribution analysis</i>
10:00 - 10:30	Health Break

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10:30 - 11:00	Laurent Cognet (Université de Bordeaux, France) <i>High-content Single-Molecule Tracking on Live Neurons with Different Imaging Modalities</i>
11:00 - 11:30	Na Ji (Janelia Farm, USA) <i>A clearer view - bringing adaptive optics to microscopy</i>
11:30 - 11:45	Guillaume Maucort (University of Queensland, St-Lucia, Australia) <i>Biophysical studies of the actin network action on neurosecretory vesicles during stimulation of exocytosis</i>
11:45 - 12:00	Jean-Claude Béique (University of Ottawa, Canada) <i>Arc-Dependent Synapse-Specific Homeostatic Plasticity</i>
12:00 - 14:00	Lunch and Poster session
14:00 - 14:30	Antoine Triller (ENS, Paris, France) <i>Probing molecular interactions with single particle tracking</i>
14:30 - 15:00	Jérôme Mertz (Boston University, USA) <i>Out-of-focus background rejection with HiLo microscopy</i>
15:00 - 15:15	Melanie Campbell (University of Waterloo, Ontario, Canada) <i>Imaging of Amyloid Beta in the Human Retina</i>
15:15 - 15:45	Health Break
15:45 - 16:00	Stefan Sokoll (Leibniz Institute, Magdeburg, Germany) <i>Towards Fast 3D Particle Tracking for Studying the Dynamics of Synaptic Signaling Molecules</i>
16:00 - 16:15	Aude Panatier (Université de Montréal, Canada) <i>Astrocytes constitutively regulate basal transmission at single hippocampal synapses</i>
16:15 - 16:30	Franck Debarbieux (IBDML, Marseille, France) <i>In vivo biphoton fluorescence microscopy combined with X-ray tomodensitometry to disclose hidden aspects of CNS pathologies</i>
16:30 - 17:00	Laurie Burns (Stanford University, USA) <i>Neuronal calcium-imaging in behaving animals</i>
17:00 - 17:30	Karl Deisseroth (Stanford University, USA) <i>Optogenetics: development and application</i>
17:30 - 19:00	Poster session

Organizing Committee

Québec : Daniel Côté, Paul De Koninck, Yves De Koninck, Mario Méthot, Paul Wiseman.
Bordeaux : Daniel Choquet, Laurent Cognet, Laurent Groc, Marc Landry.

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LIST OF ABSTRACTS

LAST NAME	FIRST NAME	ORGANIZATION	ABSTRACT	TITLE
Bates	Mark	Max Planck Institute for Biophysical Chemistry	Oral	<i>Super-resolution optical imaging of neuron structure and connectivity</i>
Bégin	Steve	Université Laval	Poster	<i>Wavelength-Swept CARS spectroscopy</i>
Béique	Jean-Claude	University of Ottawa	Poster	<i>Arc-Dependent Synapse-Specific Homeostatic Plasticity</i>
Bensimon	David	École normale supérieure	Oral	<i>Photocontrol of protein activity in live cells</i>
Bezanilla	Francisco	University of Chicago	Oral	<i>Conformational changes in ion channels detected by fluorescence</i>
Bito	Haruhiko	University of T yo Graduate School of Medicine	Oral	<i>Dual FRET-based analysis of biochemical computation performed by neuronal Ca₂⁺ signaling processes</i>
Bizheva	Kostadinka	University of Waterloo	Oral	<i>In-vivo, simultaneous imaging of retinal structure and function with a combined Electroretinography and Ultrahigh Resolution Optical Coherence Tomography system</i>
Blanpied	Thomas	University of Maryland School of Medicine	Oral	<i>Single-molecule tracking to map the dynamic interior of dendritic spines</i>
Breton-Provencher	Vincent	Université Laval	Poster	<i>Two-photon imaging of newborn cells spine dynamic in the adult olfactory bulb</i>
Burns	Laurie	Stanford University	Oral	<i>Watching the brain dynamics of motor control at the cellular scale in behaving subjects</i>
Campbell	Melanie	University of Waterloo	Oral	<i>Imaging of Amyloid Beta in the Human Retina</i>
Castonguay	Annie	Université Laval	Poster	<i>Detecting sub-cellular gradients of chloride concentration in mature cultured hippocampal neurones using Fluorescence Lifetime Imaging Microscopy (FLIM)</i>
Chamberland	Simon	Université Laval	Poster	<i>Synapse-specific inhibitory control of hippocampal feedback inhibitory circuit</i>
Choquet	Daniel	Université de Bordeaux	Oral	<i>Mechanism of activity dependent AMPAR satibilization at synapses</i>
Cognet	Laurent	Université de Bordeaux	Oral	<i>High-content Single-Molecule Tracking on Live Neurons with Different Imaging Modalities</i>
Côté	Daniel	Université Laval	Oral	<i>In-vivo imaging of demyelinating disorders</i>

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Culver	Joseph	Washington University in St-Louis	Oral	<i>Resting-state functional connectivity in humans using diffuse optical tomography</i>
Dal Maschio	Marco	Fondazione Istituto Italiano di Tecnologia	Poster	<i>A multimodal 2-photon microscope for imaging and photostimulation based on holographic illumination</i>
Debarbieux	Franck	IBDML	Oral	<i>In vivo biphoton fluorescence microscopy combined with X-ray tomodensitometry to disclose hidden aspects of CNS pathologies</i>
Deisseroth	Karl	Stanford University	Oral	<i>Optogenetics: development and application</i>
Doré	Kim	Université Laval	Poster	<i>NMDA receptor anchoring to PSD-95 is transiently disrupted in stimulated spines, a mechanism studied by FRET/FLIM</i>
Dufour	Suzie	Université Laval	Poster	<i>Monostructure microprobe for parallel optical and electrical recordings: a versatile tool for in vivo neurosciences.</i>
Dupont-Therrien	Olivier	Université Laval	Poster	<i>Parallel synaptic stimulations and rapid imaging: towards an all-optical tool for neuronal activity measurements</i>
Emiliani	Valentina	CNRS	Oral	<i>Two photon patterned photoactivation by spatiotemporal shaping of ultra-short pulses</i>
Friedrich	Rainer	Friedrich Miescher Institute	Oral	<i>Optophysiological dissection of neuronal circuit function in the zebrafish olfactory system</i>
Godin	Antoine	McGill University	Poster	<i>Measuring protein oligomerization and concentration in situ using Spatial Intensity Distribution Analysis (SpIDA)</i>
Gratton	Enrico	UCI	Oral	<i>Measuring anisotropic diffusion in cell using the pair correlation function approach</i>
Hafner	Anne-Sophie	UMR 5091 CNRS	Poster	<i>Stargazin C-Terminus Phosphorylation Induces Dissociation with Lipid Bilayers and Increases Binding to PSD95</i>
Ji	Na	Howard Hughes Medical Institute	Oral	<i>A clearer view – bring adaptive optics to microscopy</i>
Jiang	Li	Stony Brook University	Poster	<i>Modulation of cortico-amygdala circuits by optogenetic stimulation of acetylcholine release from NBM input.</i>
Knopfel	Thomas	RIKEN	Oral	<i>Imaging brain electric signals with genetically-targeted voltage-sensitive fluorescent proteins</i>
Kochevar	Irene	Massachusetts General Hospital	Oral	<i>Reconnecting nerves using photochemistry</i>
Kunik	Dario	Université de Montréal	Oral	<i>Neuronal survival study after laser axotomy</i>
Labrecque	Simon	Université Laval	Poster	<i>Probing the mechanisms regulating glutamate receptor trafficking with single quantum dot tracking</i>
Laffray	Sophie	Université Laval	Poster	<i>Image plane locking in live animals to monitor fast cellular dynamics</i>

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Lemieux	Mado	Université Laval	Poster	<i>Activity-dependent translocation of CaMKII to dendritic microtubules to support spine remodeling</i>
Levy	Hart	University of Toronto	Poster	<i>Multimodal Optical Neural Imaging utilising Coherence Control in VCSELs</i>
Lopez Ayon	Gabriela Monserratt	McGill University	Oral	<i>Combining Scanning Optical Microscopy and Dynamic Force Spectroscopy for application to Biological Membranes</i>
MacVicar	Brian	University of British Columbia	Oral	<i>Regulation of cerebral blood vessels and neuronal activity by astrocytes revealed by two photon uncaging and imaging</i>
Maucort	Guillaume	University of Queensland	Oral & Poster	<i>Biophysical studies of the actin network action on neurosecretory vesicles during stimulation of exocytosis.</i>
Mertz	Jérôme	Boston University	Oral	<i>Out-of-focus background rejection with HiLo microscopy</i>
Mohajerani	Majid	University of British Columbia	Oral & Poster	<i>Targeted microstimulation has widespread effects on background cortical spontaneous activity and intrahemispheric sensory-evoked signals</i>
Molotkov	Dmitry	University of Helsinki	Poster	<i>A new method for delivery of lipophilic dyes into brain organotypic slice culture using small glass beads</i>
Murphy	Tim	University of British Columbia	Oral	<i>Imaging and optogenetic tools for studying cortical circuit structure and function in healthy brain and after stroke</i>
Nägerl	Valentin	Inserm/University of Bordeaux 2	Oral	<i>Superresolution imaging of synapses using STED microscopy</i>
Nair	Deepak	CNRS UMR 5091	Poster	<i>Super resolution imaging of the dynamic nature of Post Synaptic Molecules</i>
Oertner	Thomas	Friedrich Miescher Institute	Oral	<i>Spine calcium transients and synaptic plasticity</i>
Pages	Stephane	Université Laval	Poster	<i>Optical recordings of millisecond time scale membrane potentials in dendritic spines</i>
Panatier	Aude	Université de Montréal	Oral & Poster	<i>Astrocytes constitutively regulate basal transmission at single hippocampal synapses</i>
Pandzic	Elvis	McGill University	Poster	<i>Image Correlation techniques applied to measure confined molecular diffusion and their potential application to complex cellular environments</i>
Rappaz	Benjamin	McGill University	Poster	<i>Increased expression of Orai1 measured with Image Cross-Correlation Spectroscopy (ICCS) is linked to an altered Ca²⁺ homeostasis in cystic fibrosis</i>
Rivard	Maxime	INRS - ÉMT	Oral & Poster	<i>The structural origin of Second Harmonic Generation in fascia</i>
Ruthazer	Edward	McGill University	Oral	<i>The interplay between synapses and structure in the developing visual system</i>
Saggau	Peter	Baylor College of Medicine	Oral	<i>Advanced Neuroimaging with Diffractive Optical Elements</i>

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Samson	Karen	Université Laval	Poster	<i>New imaging diagnostic methods for epilepsy and serotonergic troubles by endogenous fluorescent contrast</i>
Satpute	Vaishali	University of Montana	Poster	<i>Optogenetic interrogation of cholinergic transmission in the hippocampus</i>
Schwartzentruber	Jeremy	McGill University	Poster	<i>Measuring diffusion in live cells with single particle tracking and k-space image correlation spectroscopy</i>
Sokoll	Stefan	Leibniz Institute for Neurobiology	Poster	<i>Towards Fast 3D Particle Tracking for Studying the Dynamics of Synaptic Signaling Molecules</i>
Squier	Jeff	Colorado School of Mines	Oral	<i>Wide-field imaging and manipulating neuronal tissue with femtosecond laser pulses</i>
Swift	Jody	McGill University	Poster	<i>"In the past decade it has become apparent that signaling responses elicited by cell surface receptors ..."</i>
Thériault	Gabrielle	Université Laval	Poster	<i>Study of the Transversal Misalignment of an Axicon</i>
Thoumine	Olivier	CNRS 5091	Oral	<i>New synapses triggered by neurexin/neuroigin adhesion recruit AMPA receptors through a diffusion/trap mechanism</i>
Topolnik	Lisa	Université Laval	Oral	<i>Cell-type-specific and activity-dependent dynamics of Ca²⁺ signals in dendrites of hippocampal inhibitory interneurons</i>
Triller	Antoine	Institut de Biologie de L'Ecole Normale Supérieure	Oral	<i>Probing molecular interactions with single particle tracking</i>
Tsien	Richard W.	Stanford University	Oral	<i>Studying neurotransmission with improved probes and 3-D microscopy—the secret life of single vesicles</i>
Turcotte	Raphaël	Université Laval	Poster	<i>Quantitative imaging of water ordering in the central nervous system</i>
Wiseman	Paul	McGill University	Oral	<i>Deciphering synaptic receptor distributions and clustering using spatial intensity distribution analysis</i>
Yasuda	Ryohei	Duke University	Oral	<i>Postsynaptic signaling mechanisms underlying functional and structural plasticity of dendritic spines</i>



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BPW2010 VOUS INVITE AU SOUPER-SPECTACLE LE PHOTON DE L'OPÉRA

WHEN? September 23, 2010, at 7:30 PM
QUAND? 23 septembre 2010 à 19h30

WHERE? / OÙ?
 Chapelle du Musée
 de l'Amérique française

2 Côte de la Fabrique
 Quebec, QC G1R 5K1
 (418) 692-2843



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Thank you to our partners / Merci à nos partenaires

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