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Advances in Optics for Biotechnology, Medicine
and Surgery

Proceedings

10-15-2023

Conference program - ADVANCES IN OPTICS FOR BIOTECHNOLOGY, MEDICINE AND SURGERY

Frederic Leblond

Mark Niedre

Summer Gibbs

David . Cuccia

Jonathan Liu

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Program

Advances in Optics for Biotechnology, Medicine and Surgery XVII

**October 15-19, 2023
Tomar, Portugal**

Conference Chairs:

Frederic Leblond
Polytechnique Montreal, Canada

Mark Niedre
Northeastern University, USA

Conference Co-Chairs

Summer Gibbs
Oregon Health and
Science University, USA

David Cuccia
Modulim, Inc., USA

Jonathan Liu
University of Washington,
USA



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Previous conferences in this series:

Future Directions for Lasers in Medicine and Surgery

February 26-March 3, 1989

Palm Coast, Florida

Conference Chairs:

Ronald W. Waynant, FDA, USA

Ashley J. Welch, University of Texas-Austin, USA

Future Directions for Lasers in Medicine and Surgery II

February 24-March 1, 1991

Palm Coast, Florida

Conference Chairs:

Thomas F. Deutsch, Wellman Labs, MA General, USA

Ronald W. Waynant, FDA/CDRH, USA

Future Directions for Lasers in Medicine and Surgery III

February 27-March 4, 1993

Palm Coast, Florida

Conference Chair:

Joseph T. Walsh, Jr., Northwestern University, USA

Lasers in Medicine and Surgery IV

July 9-14, 1995

Snowbird, Utah

Conference Chairs:

Sharon Thompsen, University of Texas, USA

George Pettit, USDA

Advances in Optical Technology for Medicine and Surgery V

July 13-18, 1997

Snowbird, Utah

Conference Chairs:

Irving J. Bigio, Los Alamos National Laboratory, USA

Kenton W. Gregory, Oregon Medical Laser Center, USA

Bruce J. Tromberg, Beckman Laser Institute, UC Irvine, USA

Advances in Optics for Biotechnology, Medicine and Surgery VI

Aug. 1-6, 1999

Kailua-Kona, Hawaii

Conference Chairs:

David Benaron, Stanford University, USA

Eva M. Sevick-Muraca, Purdue University, USA

Arjun G. Yodh, University of Pennsylvania, USA

Advances in Optics for Biotechnology, Medicine and Surgery VII

July 22-27, 2001

Banff, Alberta, Canada

Conference Chairs:

Daniel Farkas, University of Pittsburgh, USA

Michele Follen, University of Texas, Anderson Cancer Center, USA

Michael Patterson, Hamilton Regional Cancer Center/McMaster University, Canada

Previous conferences in this series:

Advances in Optics for Biotechnology, Medicine and Surgery VIII

August 3-7, 2003

Banff, Alberta, Canada

Conference Chairs:

Molly Brewer, University of Arizona, USA

Thomas Foster, University of Rochester, USA

James Fujimoto, Massachusetts Institute of Technology, USA

Advances in Optics for Biotechnology, Medicine and Surgery IX

July 24-28, 2005

Copper Mountain, Colorado

Conference Chairs:

Stephen M. Hahn, University of Pennsylvania, USA

Vasilis Ntziachristos, Harvard University, USA

Brian Wilson, University of Toronto, Canada

Advances in Optics for Biotechnology, Medicine and Surgery X

June 10-14, 2007

Naples, Florida, USA

Conference Chairs:

Guillermo Tearney, Harvard University, USA

Samuel Achilefu, Washington University, USA

Paul M.W. French, Imperial College, London, UK

Advances in Optics for Biotechnology, Medicine and Surgery XI

June 28-July 2, 2009

Burlington, Vermont, USA

Conference Chairs:

Stephen A. Boppart, University of Illinois at Urbana-Champaign, USA

Jeremy C. Hebden, University College London, UK

Laura Marcu, University of California, Davis, USA

Advances in Optics for Biotechnology, Medicine and Surgery XII

June 5-8, 2011

Naples, Florida, USA

Conference Chairs:

Elizabeth Hillman, Columbia University, USA

Daniel Elson, Imperial College London, UK

R.C. Thomson, Vanderbilt University, USA

Advances in Optics for Biotechnology, Medicine and Surgery XIII

June 2-5, 2013

Lake Tahoe, California, USA

Conference Chairs:

James W. Tunnell, University of Texas at Austin, USA

Maryann Fitzmaurice, Case Western University, USA

A.C. Boccara, ESPCI-Paris Tech., France

Previous conferences in this series:

Advances in Optics for Biotechnology, Medicine and Surgery XIV

June 14-17, 2015

Vail, Colorado, USA

Conference Chairs:

Rainer Leitgeb, Medical University of Vienna, Austria
Richard Levenson, University of California – Davis, USA
Laura Waller, University of California, Berkeley, USA

Advances in Optics for Biotechnology, Medicine and Surgery XV

July 23-26, 2017

Snowmass Village, Colorado, USA

Conference Chairs:

Peter So, Massachusetts Institute of Technology, USA
Kate Bechtel, Triple Ring Technologies, USA
Ivo Vellekoop, University of Twente, The Netherlands
Michael Choma, Yale University, USA

Advances in Optics for Biotechnology, Medicine and Surgery XVI

June 2-6, 2019

Quebec, Canada

Conference Chairs:

Erin Buckley, Emory University/Georgia Institute of Technology, USA
Christophe Moser, Polytechnique Fédérale de Lausanne (EPFL), Switzerland
Brian Pogue, Dartmouth College, USA
David Sampson, University of Surrey, United Kingdom

Conference Sponsors

Intuitive Surgical

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Sunday, October 15, 2023

17:30 – 18:30	Conference check-in
18:30 – 19:30	Welcome reception (with music)
19:30 – 21:00	Dinner
21:00 – 22:00	Social Hour (Lobby Bar)

NOTES

- *Audio, still photo and video recording by any device (e.g., cameras, cell phones, laptops, watches) is strictly prohibited during the technical sessions, unless the author and ECI have granted prior permission.*
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Monday, October 16, 2023

07:30 – 08:30 Breakfast and Discussion Time

08:30 – 08:40 Conference Welcome – Conference Chairs

Session 1: Optics in Surgical Interventions I

Session Chair: Frederic Leblond

08:40 – 09:10 **Can near infrared nerve-specific imaging improve surgical outcomes?**
Summer Gibbs, Oregon Health and Science University, USA

09:10 – 09:40 **Seeing early cancer in a new light with hyperspectral endoscopy**
Sarah Bohndiek, University of Cambridge, United Kingdom

09:40 – 10:10 **Advanced optical imaging for surgical vision**
Sylvain Gioux, Intuitive Surgical, Switzerland

10:10 – 10:40 **Intraoperative detection of insufficient surgical margins in head and neck cancer resection using dual aperture fluorescence ratio imaging**
Kenneth Tichauer, Illinois Institute of Technology, USA

10:40 – 11:10 Coffee Break (Lobby Bar) and Discussion Time

Session 2: Optics in Surgical Interventions II

Session Chair: Brian Wilson

11:10 – 11:40 **What role in surgery for Raman spectroscopy?**
Frederic Leblond, Polytechnique Montreal, Canada

11:40 – 12:10 **Development of imaging probes for fluorescence guided surgery of GI and endocrine tumors**
Michael Bouvet, University of California San Diego, USA

12:10 – 12:40 **TBA**
Pablo Valdes, University of Texas Medical Branch, USA

12:40 – 13:10 **Beyond tumor-to-background ratios: Methods for improved decision making in fluorescence guided surgery**
Kimberley Samkoe, Thayer School at Dartmouth, USA

13:10 – 14:30 Lunch

Session 3: Microscopic Imaging in Biomedicine I

Session Chair: Melissa Skala

14:30 – 15:00 **Non-destructive 3D pathology and analysis for precision medicine**
Jonathan Liu, University of Washington, USA

15:00 – 15:30 **Low-cost, in vivo microscopy**
Dongkyun Kang, University of Arizona, USA

15:30 – 16:00 **Autofluorescence lifetime imaging to monitor immune cell metabolism and function**
Melissa Skala, Morgridge Institute for Research, USA

Monday, October 16, 2023 (continued)

- 16:00 – 16:30 **Cell tracking in vivo: From hematopoietic stem cells to mature leukocytes**
Charles P. Lin, Wellman Center for Photomedicine, Massachusetts General
Hospital, USA
- 16:30 – 18:00 Coffee Break and **Poster Session I** (Convento Room)
- Session 4: Microscopic Imaging in Biomedicine II**
 Session Chair: Kenneth Tichauer
- 18:00 – 18:30 **Label-free fluorescence lifetime techniques for image-guided interventions**
Laura Marcu, University of California, Davis, USA
- 18:30 – 19:00 **Fast mid-infrared imaging with non-degenerate two-photon absorption**
Eric Potma, University of California, Irvine, USA
- 19:00 – 19:30 **Investigating cellular metabolic changes in response to therapy using two-
photon excited autofluorescence**
Narasimhan Rajaram, University of Arkansas, USA
- 19:30 – 21:00 Dinner
- 21:00 – 22:00 Social Hour (Lobby Bar)

Tuesday, October 17, 2023

07:30 – 08:30 Breakfast and Discussion Time

Session 5: Vascular Imaging and Biofluid Studies

Session Chair: Summer Gibbs

08:30 – 09:00 **Towards fluorescence molecular in vivo liquid biopsy of circulating tumor cells**

Mark Niedre, Northeastern University, USA

09:00 – 09:30 **Minimally-invasive surgical application of multispectral and polarization resolved imaging**

Dan Elson, Imperial College, United Kingdom

09:30 – 10:00 **Extreme imaging cytometry - From instrumentation to AI acceleration**

Kevin Tsia, The University of Hong Kong, Hong Kong

10:00 – 10:30 **Shortwave infrared imaging and spectroscopy in the time and spatial frequency domains**

Darren Roblyer, Boston University, USA

10:30 – 11:00 Coffee Break (Lobby Bar) and Discussion Time

Session 6: Optics in Neurosciences and Neuropathology I

Session Chair: Kimberly Samkoe

11:00 – 11:30 **Minimally invasive monitoring of the central nervous system**

David Busch, University of Texas Southwestern, USA

11:30 – 12:00 **High-resolution imaging of myelin loss and degradation in neurodegenerative diseases with birefringence microscopy**

Irving Bigio, Boston University, USA

12:00 – 12:30 **Optical spectroscopy for real-time neuronavigation during deep brain stimulation surgeries**

Daniel Côté, CERVO Brain Research Center, Université Laval, Canada

12:30 – 14:00 Lunch

14:00 – 18:00 Excursion – Guided tour of the Convento de Cristo

Session 7: Optics in Neurosciences and Neuropathology II

Session Chair: Daniel Côté

18:30 – 19:00 **Non-invasive evaluation of microvascular and endothelial function with hybrid near-infrared spectroscopies**

Turgut Durduran, ICFO-The Institute of Photonic Sciences, Spain

19:00 – 19:30 **Assessing cerebrovascular insufficiency and neural risk with diffuse optical methods**

Maria Angela Franceschini, Massachusetts General Hospital, Harvard Medical School, USA

19:30 – 20:00 **Changes in neurovascular coupling as an indicator of cerebral health**

Jana Kainerstorfer, Carnegie Mellon, USA

Tuesday, October 17, 2023 (continued)

20:00 – 21:30

Dinner

21:30 – 22:30

Social Hour (Lobby Bar)

Wednesday, October 18, 2023

07:30 – 08:30 Breakfast and Discussion Time

Session 8: Automated Learning Approaches in Biomedicine

Session Chair: Narasimhan Rajaram

08:30 – 09:00 **Multimodal computational pathology**
Faisal Mahmood, Harvard Medical School, USA

09:00 – 09:30 **Real-time label-free AI-enhanced digital histopathology using SLAM microscopy**
Stephen Boppart, University of Illinois Urbana-Champaign, USA

09:30 – 10:00 **Multimodal computational colonoscopy**
Nicholas Durr, Johns Hopkins University, USA

Session 9: Imaging Device Standards and Tissue Phantoms

Session Chair: Dongkyun Kang

10:00 – 10:30 **Phantoms to accelerate technology development and standardization in Biophotonics**
Stefan Andersson-Engels, Tyndall National Institute, Ireland

10:30 – 11:00 **Tools to build consensus and accelerate clinical translation of intraoperative fluorescence imaging**
Ethan LaRochelle, QUEL Imaging, USA

11:00 – 11:30 Coffee Break (Lobby Bar) and Discussion Time

Session 10: Nanomedicine

Session Chair: Mark Niedre

11:30 – 12:00 **Nanobody-based fluorescent contrast agents for rapid and specific intra-operative tumor visualization**
Sophie Hernot, Vrije Universiteit Brussel, Belgium

12:00 – 12:30 **Multifunctional porphyrin-lipid nanoparticles for cancer theranostics: From discovery to first-in-human and beyond**
Brian Wilson, University Health Network, Canada

12:30 – 14:00 Lunch

14:00 – 15:30 Free Time / Discussions

15:30 – 17:00 Coffee Break and **Poster Session II** (Convento Room)

Session 11: Contributed Talks

Session Chair: Jonathan Liu

17:00 – 17:20 **The tauVIVO time-domain fluorescence imaging system for the simultaneous imaging of ICG and targeted NIR tracers**
Hans Ingelberts, Vrije Universiteit Brussel, Belgium

Wednesday, October 18, 2023 (continued)

- | | |
|---------------|--|
| 17:20 – 17:40 | Fluorescence depth quantification using spatial frequency imaging and deep learning reconstruction
Michael Daly, Princess Margaret Cancer Centre, Canada |
| 17:40 – 18:00 | Near infrared fluorescent anti-mucin antibodies target and brightly label colonic polyps in CPC-APC mice
Kristin Cox, UC San Diego, USA |
| 18:00 – 18:30 | Free Time |
| 18:30 – 19:30 | Wine Tasting |
| 19:30 – 21:00 | Conference Banquet |
| 21:00 – 22:00 | Social Hour (Lobby Bar) |

Thursday, October 19, 2023

07:30 – 09:00 Breakfast and Discussion Time

Session 12: Clinical Translation of Emerging technologies

Session Chair: Jana Kainerstorfer

09:00 – 09:30 **Coherent spatial imaging of hemodynamics**
Bernard Choi, University of California, Irvine, USA

09:30 – 10:00 **Monitoring radiotherapy with functional OCT: Microvascular responses and correlations with MRI**
Alex Vitkin, University of Toronto / Princess Margaret Cancer Centre, Canada

10:00 – 10:30 **Computational approaches for model-based Diffuse Optical Tomography**
Hamid Dehghani, University of Birmingham, United Kingdom

10:30 – 11:00 **Low-cost optoacoustics? Prospects for miniaturizing and democratizing optoacoustic imaging systems in biomedical research and the clinics**
Cagla Ozsoy, ETH Zurich, Switzerland

11:00 Coffee break and boxed lunches available

Check-out (by 12 Noon) and Departure

Poster Presentations

1. **A low-cost, compact device for monitoring tissue oxygen consumption using speckle contrast optical spectroscopy**
Andres Quiroga, ICFO, Spain
2. **Preliminary investigation of non-invasive blood pressure estimation using speckle contrast optical spectroscopy**
Ariane Garrett, Boston University, USA
3. **A combined frequency domain near infrared spectroscopy and diffuse correlation spectroscopy system for monitoring the sternocleidomastoid muscle**
Carlos Gomez, Boston University, USA
4. **Measurements of human cerebral blood flow changes with speckle contrast optical spectroscopy**
David Boas, Boston University, USA
5. **Fiber-based wavelength-swept spontaneous Raman spectroscopy for brain tissue classification**
Elahe Parham, CERVO Brain Research Center, Université Laval, Canada
6. **Creating Open-Source software packages for Raman spectrum processing and analysis**
Guillaume Sheehy, Polytechnique Montreal, Canada
7. **Guiding nanoparticle enhanced photothermal therapy for cancer with photoacoustic thermal imaging and diffuse optical tomography**
Ivan Kosik, University Health Network Toronto, Canada
8. **Polarized light microscopy for quantitative assessment of colorectal cancer: Can we predict local recurrence?**
Kseniia Tumanova, University of Toronto, Canada
9. **High-density speckle contrast optical tomography of cerebral blood flow of the adult brain**
Lisa Kobayashi-Frisk, ICFO - The Institute of Photonic Sciences, Spain
10. **Monitoring of cerebral autoregulation during early mobilization towards personalization of post-stroke mobilization**
Lisa Kobayashi-Frisk, ICFO-The Institute of Photonic Sciences, Spain
11. **Tissue classification of breast cancer by hyperspectral unmixing**
Lynn-Jade Jong, Netherlands Cancer Institute, Netherlands
12. **A smartphone autofluorescence imaging platform and classification algorithm for the early detection and referral of oral lesions in primary care settings**
Ruchika Mitbander, Rice University, USA
13. **Excitation-emission characterization of ICG in biologically relevant solutions**
Sophie Lyon, QUEL Imaging, USA
14. **Addressing the effects of skin tone on photoacoustic imaging**
Thomas Else, CRUK Cambridge Institute, University of Cambridge, United Kingdom
15. **Optical measurement of a guidewire displacement during percutaneous coronary interventions**
Thomas Shooner, Laval University, Canada