PROGRESS IN BIOMEDICAL OPTICS AND IMAGING
Vol. 11, No. 7

Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine XIV

Joseph A. Izatt
James G. Fujimoto
Valery V. Tuchin
Editors

25–27 January 2010
San Francisco, United States

Sponsored and Published by
SPIE

Volume 7554

Proceedings of SPIE, 1605-7422, v. 7554

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:
Author(s), "Title of Paper," in *Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine XIV*, edited by Joseph A. Izatt, James G. Fujimoto, Valery V. Tuchin, Proceedings of SPIE Vol. 7554 (SPIE, Bellingham, WA, 2010) Article CID Number.

ISSN 1605-7422
ISBN 9780819479501

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

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Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

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Contents

POSTER SESSION

Conference Committee

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Xingde Li, The Johns Hopkins University (United States)
Adrian Gh. Podoleanu, University of Kent (United Kingdom)
Andrew M. Rollins, Case Western Reserve University (United States)
Natalia M. Shakhova, Institute of Applied Physics (Russian Federation)
Guillermo J. Tearney, Massachusetts General Hospital (United States)
Ruikang Wang, Oregon Health & Science University (United States)
Maciej Wojtkowski, Nicolaus Copernicus University (Poland)
Yoshiaki Yasuno, University of Tsukuba (Japan)

Session Chairs

1 Cardiovascular Applications
Joseph A. Izatt, Duke University (United States)

2 Endoscopic and Cancer Imaging
James G. Fujimoto, Massachusetts Institute of Technology (United States)

3 Ophthalmic: New Technology
Maciej Wojtkowski, Nicolaus Copernicus University (Poland)

4 Cellular and Small Animal Imaging
Andrew M. Rollins, Case Western Reserve University (United States)

5 Other Clinical Applications
Wolfgang Drexler, Cardiff University (United Kingdom)

6 Doppler OCT
Rainer A. Leitgeb, Medizinische Universitat Wien (Austria)

7 OCT New Technology
Guillermo J. Tearney, Wellman Center for Photomedicine (United States)

8 Swept Light Source New Technology
Zhongping Chen, University of Illinois at Urbana-Champaign (United States)

9 PSOCT
Christoph K. Hitzenberger, Medizinische Universität Wien (Austria)

10 Signal/Image Processing
Ruikang Wang, Oregon Health & Science University (United States)

11 Novel Contrast Mechanisms
Stephen A. Boppart, University of Illinois at Urbana-Champaign (United States)

12 Full Field/OCM/Phase Contrast
Valery V. Tuchin, Saratov State University (Russian Federation)

Introduction

These proceedings are from the Coherence Domain Optical Methods and Optical Coherence Tomography in Biomedicine XIV conference held January 25-27, 2010 at the SPIE Photonics West Symposia in San Francisco, California. This year's conference featured 111 oral and poster presentations from leading national and international research groups.

The conference was organized into several sessions including: Cardiovascular Applications; Endoscopic and Cancer Imaging; Ophthalmic New Technology; Cellular and Small Animal Imaging; Other Clinical Applications; Doppler OCT; OCT New Technology; Swept Light Source New Technology; PSOCT; Signal/Image Processing; Novel Contrast Mechanisms; Full Field/OCM/Phase Contrast, and a poster session with 28 presentations. As usual, a predominant fraction of the papers focused on optical coherence tomography – basic research, instrumentation and applications.

This year there were significant advances in clinical and biological applications (five sessions: Cardiovascular Applications; Endoscopic and Cancer Imaging; Ophthalmic New Technology; Cellular and Small Animal Imaging; Other Clinical Applications, with 34 oral and 11 poster presentations) with discussion of OCT technologies for studying coronary arteries including the natural history of coronary atherosclerotic plaques, real-time monitoring of cardiac RF-ablation lesion formation, monitoring of shear stress in the developing heart tube, *in vivo* early detection of airway injury, *in vivo* tomography of sub-pleural lung parenchyma in the intact thorax, multi-scale imaging of thyroid pathologies, *in vivo* 3D-imaging of swine esophagus, clinical study of the biliary tree, differentiating carcinogenesis stages of oral lesions, real-time monitoring of vitreoretinal surgery, choroidal neovascularization and retinal imaging, keratometry, studying cell chemotaxis and dynamics, live rat embryos and muscular dystrophy in mouse model imaging, monitoring of sutured flexor tendons and temporomandibular joint disc, monitoring of skin disease, the nerve fiber and optic nerve head imaging, noninvasive assessment of biofilm growth in the middle ear, guidance of hard tissue ablation, and for some other fields of clinical application.

Six oral presentations in the session on Doppler OCT reported advanced technologies for speckle mediated tracking of tumor angiogenesis and response to vascular targeted PDT, optical micro-angiography in brain trauma, full range Doppler optical tomography, and high-resolution wide-field blood perfusion mapping of retina and choroid. The influence of blood optical inhomogeneity on Doppler OCT signal was also discussed. Real-time bulk motion insensitive flow segmentation algorithms for Doppler spectral OCT were presented as well.

The session on OCT New Technologies contained eight oral papers and was devoted to further development of OCT components and whole systems, such as Fourier-domain mode-locked (FDML)-based multi-spot OCT at 4,100,000 A-scans and 4 Gvoxels per second, multichannel OCT using a high-power telescope-less polygon-based swept laser in dual amplifier configuration, a novel sample arm for dynamic optical coherence elastography, large field OCT by optical movement tracking of a single point probe, integrated photonic circuit in silicon on insulator for FD OCT, and novel CW stable and high-power supercontinuum light source.

A special session on Swept Light Source New Technology contained eight oral presentations with discussion of frequency comb swept lasers, compact ultrafast reflective Fabry-Perot tunable lasers, FDML lasers – high frequency driving vs. buffering, ultra-broadband FDML swept source based on dual SOAs and WDM couples, fiber-based swept source at 1060 nm using tapered amplifier, swept source system based on integrated thermo-optic tunable laser chip, and wavelength swept amplified spontaneous emission source at 1060 nm with Yb-doped fiber post-amplification.

This year's Polarization-Sensitive OCT (PSOCT) session with six oral presentations highlighted the following actual problems: melanin inherent contrast based on depolarization and PSOCT FD imaging based on depolarized of light, and described a number of advanced systems: full range PS swept-source OCT at 1 μm with polarization modulation and BM-mode scan, single camera PS spectral-domain OCT by spatial frequency encoding, high-speed spectral-domain PS OCT using a single InGaAs line-scan camera and an optical switch, and ultrahigh-resolution fiber-based PS spectral-domain OCT.

The Signal/Imaging Processing session presented six oral papers on controlling the shape of Talbot bands' visibility to improving the sensitivity decay with depth in FD-OCT, performance of reduced bit-depth acquisition for FD-OCT, sonification of OCT data and images, non-harmonic analysis for high-resolution OCT, resolution improvement in OCT by step-frequency encoding, and twofold improvement in axial resolution of OCT by four-pass sample probing.

The Novel Contrast Mechanisms session contained seven oral presentations and discussed magnetomotive OCT for *in vivo* molecular imaging of mammary tumor using targeted magnetic nanoprobes and for elastographic relating lung structure and function in cystic fibrosis, the development of pump-probe OCM, monitoring of multimodal gold nanoparticle delivery, tissue differentiation in human lymph nodes using parameterized OCT, reconstruction of absorption profile of ICG using spectral OCT, and monitoring small changes in blood hematocrit using phase-sensitive spectral-domain OCT.

The last session on Full Field/OCM/Phase Contrast with eight oral papers presented a number of techniques and applications including dark-field OCM, ultrahigh speed phase mapping (512,000 A-scan rate) line field FD OCT, crosstalk

rejection in full-field OCT using spatially incoherent illumination with a partially coherent source, low-coherence enhanced backscattering imaging with multiple spatial filters, double common-path phase microscopy, breast cancer surgery and full-field OCT in the operative room, and sub-cellular resolution imaging with Gabor-domain OCM.

The poster session contained 28 papers on the major topics mentioned above.

A short course for engineers, scientists, and clinicians; SC312: Principles and Applications of Optical Coherence Tomography by James Fujimoto accompanied the conference.

All submissions were fully peer reviewed. Authors were requested to submit a 3-page summary of their paper. The program committee evaluated the submissions for technical content and assigned a numerical score to each paper. The selection of the papers as oral presentations, posters, or non-acceptance was based upon the program committee score. We have had very positive feedback and a record number of submissions and attendees again this year.

The conference chairs would like to thank the members of the technical program committee for their help in organizing the conference. We sincerely appreciate the support of the SPIE and the conference staff. Finally, we would like to thank all of the conference attendees and manuscript authors for their contributions and participation which helped to make this meeting a success.

Joseph A. Izatt
James G. Fujimoto
Valery V. Tuchin