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Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine XIII

James G. Fujimoto
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Editors

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Introduction

These proceedings are from the conference on Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine XIII, held 26-28 January, 2009 at SPIE's Photonics West Symposium in San Jose, California. This year's conference featured 96 oral and poster presentations from leading national and international research groups.

The conference was organized into several sessions, including: Ophthalmic OCT: New Technology; Ophthalmic/Doppler; Cellular and Small Animal Imaging; Clinical Applications; Novel Contrast Mechanisms; Endoscopic/Catheter Technology; Polarization Sensitive; Full Field/Parallel/Phase Contrast Methods; Signal/Imaging Processing; Doppler OCT; Novel Technology; and Novel Light Sources, and a poster session with 19 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 ophthalmic research using OCT (three sessions: Ophthalmic OCT: New Technology, Ophthalmic/Doppler, and Polarization Sensitive) with 15 oral and 3 poster presentations) with discussion of *in vivo* FD OCT of the human retina with up to 312,000 lines/s and other fast real-time OCT systems based on ultra-high-speed swept light sources, blood flow imaging at deep posterior human eye, cyclic reconstruction of 4D retinal blood flow with pulse synchronization, comparative study of retinal blood flow in normal and glaucoma subjects, novel method of optical blood perfusion micro-angiography within human retina and choroids, quantitative measurement of polarization properties of retinal layers, discrimination of conjunctiva and sclera using PS OCT, and providing birefringence imaging of the posterior eye segment.

Application of OCT technology to cellular and small animal imaging is a novel approach in cell and development biology, which was presented in the special session on Cellular and Small Animal Imaging and other sessions with ten oral and two poster presentations, with discussion of cellular structure in the living human retina by means of ultra-high-speed and spatial resolution OCT with pancorrection, modeling OCT signal response of human retinal photoreceptors to plane wave illumination and experimental probing of retinal physiology in rats *in vivo*, measuring apoptosis in human RPE cells based on OCT monitoring of light scattering change, imaging of cardiovascular dynamics in mouse embryos by swept source OCT, enhanced OCT imaging of embryonic tissue with optical clearing, photothermal OCT of epidermal growth factor receptor in living cells using immunotargeted gold nanospheres, subcellular vibrational imaging using a molecular OCT/Raman technique, OCT detection of mechanical resonances used for elastography of small biosamples, screening retinal transplants, and imaging the structure and growth of three-dimensional ovarian tumor models.

Nine oral presentations in the sessions on Clinical Applications and Endoscopic/Catheter Technology reported advanced OCT technologies for *in vivo* visualization and quantification of coronary artery microstructure in humans, three-dimensional endomicroscopy of the human colon, cardiac radiofrequency ablation, pancreatic cancer diagnosis and guided therapy, oral cancer diagnosis, microstructures and metastasis in human breast lymph nodes, and urological disease.

The sessions on Endoscopic/Catheter Technology, Polarization Sensitive, Full Field/Parallel/Phase Contrast Methods, Signal/Imaging Processing, Doppler OCT, Novel Technology, and Novel Light Sources contained 33 oral papers and 5 poster presentations devoted to further development of OCT components and whole systems, such as real-time swept source OCT for human airway imaging using a microelectromechanical system endoscope and digital signal processor, robust high-resolution fine OCT needle, transverse scanning phase contrast coherence microscopy, swept source parallel OCT, real-time single-shot full-field OCT based on dual-channeled phase-stepper optics and two-dimensional quaternionic analytic signal processing, dispersion encoded full-range FD OCT, interferometric synthetic aperture microscopy with a portable intraoperative OCT system, bi-directional Doppler FD OCT system, OCT speckle reduction with angular compounding by B-scan Doppler-shift encoding, ultra-miniature swept source for point care FD OCT, novel wavelength-swept Raman laser for arbitrary gain band OCT, and 100-kHz axial scan rate swept-wavelength OCT.

The poster session contained 19 papers on the major above-mentioned topics.

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 and authors were requested to submit a three-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. Although this process was time-consuming, we felt that it was important for the conference, and many participants felt that the technical quality and novelty of the papers had increased as the result of peer review. The peer review also provided a fairer assessment of the submitted papers.

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.

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