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Coherence Domain Optical Methods and Optical Coherence Tomography in Biomedicine XI

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

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Introduction

These proceedings are from the Coherence Domain Optical Methods and Optical Coherence Tomography in Biomedicine XI conference, held 22–24 January 2007 at the SPIE Photonics West Symposium in San Jose, California. This year's conference featured a scheduled 104 oral and poster presentations from leading national and international research groups.

The conference was organized into several sessions including: Retinal Imaging I, II, and III; In Vivo Imaging Applications; Retinal and Other Ophthalmic Applications; Doppler and Polarization-Sensitive OCT; Novel Techniques; Fourier Domain OCT; Fourier Domain Swept Source OCT; Full-Field Imaging Techniques; Novel Contrast Mechanisms; and a poster session with 34 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 retinal imaging (four sessions, 20 oral and three poster presentations) with discussion of new techniques in near infrared (1050–1060 nm spectral range), ultrahigh-resolution adaptive optics systems, spectral/Fourier domain OCT for imaging retinal morphology, measurements of hemodynamics in the human eye, and clinical applications of polarization-sensitive OCT.

In vivo 3D transcranial imaging of blood vessel network in mice using ultrafast spectral/Fourier domain OCT, imaging of the embryonic heart using gated OCT, investigations of skin cancer, summary of recent clinical endoscopic studies, results on the human larynx and esophagus imaging, were presented and discussed in six papers in the session on In Vivo Imaging Applications.

Eight oral presentations in the session on Doppler and Polarization-Sensitive OCT reported advanced technologies for quantification of 3D velocity vector, imaging vasculature independent of flow direction, 4D Doppler imaging of cardiac and vascular flow dynamics, and morphological influences on blood flow in the developing embryo heart. New approaches in polarization-sensitive OCT were also discussed in this session.

The session on Novel Techniques contained six oral papers, and was devoted to further development of Doppler systems, increasing of measurement depth of linear OCT system and depth of field of Fourier domain optical coherence microscopy. New image reconstruction algorithms as well as depth-resolved monitoring of analytes diffusion in ocular tissues and real-time monitoring of laser therapy using phase-sensitive OCT were also presented on this session.

Two sessions on Fourier Domain OCT had 12 oral papers and discussed full-range, high-axial resolution, high speed, and high-sensitive Fourier domain OCT systems. Systems described in six papers were based on swept sources including a phase-

sensitive system with a Fourier domain mode-locked laser at up to 380,000 scans per second.

Various full-field OCT modalities were discussed in five papers in the session on Full-Field Imaging Techniques, including line-field swept source OCT, dual-channel full-field OCT, line-scanning OCM, line-field spectral domain OCT, and high numerical aperture OCT. One paper presented measurements of topographic phase image of living cells by white-light phase-shifting microscope with active stabilization of optical path difference.

The closing session on Novel Contrast Mechanisms with eight papers was devoted to description of different approaches of OCT image contrasting based on speckle reduction, polarization and magnetomotive measurements, ground state recovery pump-probe technique, and backscattering albedo contrasting using gold nanorods. One paper described principles of functional imaging using dynamic speckles in digital holography.

The poster session contained 34 papers on the major above-mentioned topics. In order to enhance the visibility of poster presentations for the second time, since in 2006 a poster preview session was organized. During this session, 20 three-minute oral presentations of posters were discussed.

Short courses for engineers, scientists, and clinicians, "Principles and Applications of Optical Coherence Tomography," by James Fujimoto, and "Optical Clearing of Tissue and Blood," by Valery Tuchin, accompanied the conference.

All submissions were fully peer reviewed. 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. 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. We have had very positive feedback and a record number of submissions 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 SPIE 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