Focus Issue: Optical Coherence Tomography

Introduction

The pace of technological advancement of Optical Coherence Tomography (OCT) over the last several years has been extremely rapid. The field has progressed from one-dimensional low-coherence ranging to full three-dimensional imaging with individual two-dimensional images aquired at near video rate in a span of less than eight years. Imaging applications have included polymers and advanced composites, Ophthalmology, Developmental Biology, Gastroenterology, Urology, Cardiology, Neurology, and Gynecology. These preliminary studies indicate the great potential for OCT to make a significant impact, especially in clinical medicine.

This focus issue presents current results from several of the leading laboratories investigating the technology and application of OCT. In the first paper, Joseph Schmitt describes a completely new application using OCT to image microscopic deformation and strain in tissues. The hope for this new paradigm is that structural deformations in tissues can be correlated with disease processes.

Another recent advancement, polarization sensitive OCT, permits the quantitative assessment of tissue birefringence. Johannes de Boer and others at the Beckman Laser Institute have pioneered the application of polarization sensitive OCT to assess tissue modification due to heating or burns. They present their latest results imaging thermally damaged tissue.

The rapid acquisition of two-dimensional images using OCT has been an essential advancement for applying OCT to imaging *in vivo* where motion artifacts might otherwise obscure fine detail. Andrew Rollins et al. review the theory of using a rapid scanning delay line based on diffraction and demonstrate the fastest acquisition OCT system to date.

While OCT has been used extensively to determine the structure of soft biological tissues, two groups have recently demonstrated that clinically relevant penetration into calcified tissue such as teeth can also be achieved. Both of these groups, Colston et al. at Lawrence Livermore National Laboratory and Feldchtein et al. in Russia present their most recent work applying OCT to oral tissues.

The ability of modified OCT systems to discern flow within biological samples has been demonstrated by both the Beckman Laser Institute and the Case Western Reserve University groups. In this issue Jennifer Barton presents her recent research using Doppler OCT to investigate the interaction of pulsed dye-laser light with blood vessels.

The final contribution to this issue is from a collaboration in Nizhny Novgorod, Russia that has pioneered that application of OCT in human *in vivo* studies. Through the development of endoscopic and laparoscopic OCT probes, this group has investigated the imaging of many human systems and presents in this issue their current results visualizing the structure of the larynx, bladder and uterine cervix.

I would like to thank each of the contributing authors for their participation in making this special issue a success.

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