Special Section Guest Editorial

This special section entitled ''Coherence Domain Optical Methods in Biomedical Science and Clinics'' is a continuation of the publication of invited and submitted papers on coherence effects in biomedical science and clinical applications started in the January and July 1998 issues of the *Journal of Biomedical Optics*. Fourteen papers on Interferometry in Biomedicine written by recognized experts in the field were published in those issues. This issue contains ten papers, including two overview papers on ''Speckle in optical coherence tomography'' by J. M. Schmitt, S. H. Xiang, and K. M. Yung, and on ''Coherent optical techniques for the analysis of tissue structure and dynamics'' by V. V. Tuchin. The overview by Schmitt et al. gives the basic physics of speckle phenomenon and its effects on optical coherence tomography (OCT). The problem of improving the signal-to-noise ratio by speckle reduction is well discussed by the authors. The overview should be very useful for understanding propagation of coherence light in random media. The paper by V. V. Tuchin presents a review on the coherent detection technologies for biomedical applications. The major part of the discussed technologies is based on speckle and polarimetric techniques recently designed for tissue and cell structure and motion imaging and monitoring by the biomedical optics group of Saratov Scientific Center in Russia.

Four papers relate to partial coherence interferometry (PCI) and OCT, and present novel techniques or a new field of biomedical applications. The paper by K. M. Yung, S. L. Lee, and J. M. Schmitt, ''Phase-domain processing of optical coherence tomography images,'' is a development of the hardware and software for recording and processing the phase of the OCT signal that gives an opportunity to correct phase aberrations responsible for speckle noise in tomography images. The next two papers, by V. Kamensky et al., ''*In situ* monitoring of laser modification process in human cataractous lens and porcine cornea using coherence tomography,'' and by C. K. Hitzenberger et al., ''Dispersion effects in partial coherence interferometry: implications for intraocular ranging,'' provide *in situ* monitoring of eye tissue microsurgery and intraocular ranging. The use of a dispersion compensating element, and the employment of a broadband superluminescent diode, allow C. K. Hitzenberger et al. to demonstrate a resolution of 5 μm in the retina of a human eye *in vivo*. The paper by M. Böhnke et al., ''Precision and reproducibility of measurements of human corneal thickness with rapid optical low-coherence reflectometry (OLCR),'' presents precise *in vivo* measurements of the corneal thickness using a rapid optical pachometer built on the base of a single mode fiber optic Michelson interferometer.

The next two papers by D. A. Zimnyakov, V. V. Tuchin, and A. G. Yodh, ''Characteristic scales of optical field depolarization and decorrelation for multiple scattering media and tissues,'' and by J. D. Briers, G. Richards, and X. W. He, ''Capillary blood flow monitoring using laser speckle contrast analysis (LASCA),'' are devoted to analysis of dynamic speckles in tissue-like phantoms and tissues. In the paper by Zimnyakov et al., results of correlation and polarization measurements with phantoms and tissues with controlled optical properties (such as the human sclera) are presented. In the paper by Briers et al. the updated configuration of the LASCA technique and some recent developments in the search for a real-time, noninvasive, full-field technique for visualizing capillary blood flow are described.

The paper by T. J. Licznerski, H. T. Kasprzak, and W. Kowalik, ''Application of Twyman–Green interferometer for evaluation of *in vivo* breakup characteristic of the human tear film,'' presents an interferometric method of assessing the *in vivo* stability of the precorneal tear film. The dynamic effects on a human cornea were successfully studied.

The paper by H. Zhang et al., ''Time integrated spectroscopy of turbid media based on the microscopic Beer–Lambert law: application to small phantoms having different boundary conditions,'' deals with a related topic of this special section, in particular, with time-integrated spectroscopy and its applicability for quantifying absorbers in small-size media having different boundary conditions. The described results will be useful for understanding some effects in the application of coherence-domain methods with scattering media of limited volume and having various boundary conditions.

We would like to thank all the authors for their contribution to this series of JBO special sections, which will be a good supplement for the recently published SPIE Proceedings [V. V. Tuchin, H. Podbielska, and B. Ovryn (Eds.), *Coherence Domain Optical Methods in Biomedical Science and Clinical Applications*, *Proc. SPIE* **2981** (1997); V. V. Tuchin and J. Izatt (Eds.), *Coherence Domain Optical Methods in Biomedical Science and Clinical Applications II*, *Proc. SPIE* **3251** (1998)].

Finally, we do apologize that for some technical reasons this special section was delayed from the planned publication date of April 1998.

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