SPECIAL SECTION GUEST EDITORIAL

Tissue Polarimetry

Tissue polarimetry is an emerging area of technology development in tissue optics that is expected to lead to important research applications in biology and medicine. Traditional polarimetry is a mature field, but its application to thick tissues has been hindered by technical hurdles associated with multiple light scattering. However, light is intrinsically polarized; and many biological tissue components or molecules—such as collagen, muscle fibers, keratin, retina, and glucose—possess polarization properties. Further, biological scatterers—such as cell nuclei and mitochondria—alter light polarization upon each scattering event according to the geometric and optical parameters of the scatterers. Since incident polarized light is rapidly depolarized by scattering, polarization-sensitive detection of reflected or transmitted light selects only the early escaping photons and rejects multiply scattered light. Hence, polarized light offers a means of gating: reflected polarized photons interrogate superficial tissue layers, whereas transmitted polarized photons image the ballistic or quasi-ballistic region. Polarization can therefore provide novel contrast mechanisms for imaging, diagnosis, and sensing.

The call for papers received a very positive response as indicated by the thirteen accepted manuscripts. This special section covers the following topics in tissue polarimetry: The effect of laser speckle on the degree of polarization, polarized reflectometry, propagation of polarized light in biological tissues, measurements of intensity-based Mueller matrices, polarized angular-dependent spectroscopy, polarization microscopy, Jones- or Mueller-matrix optical coherence tomography (OCT), polarization-sensitive OCT and Stokes vector determination, polarization imaging of skin lesions, and glucose sensing.

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Special Section Guest Editors