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EDITORIAL

Preface to the special issue on “Biomedical Optics”

Dan ZHU (✉)[1], Walter BLONDEL[2], Junle QU[3], Xueding WANG[4], Sihua YANG (✉)[5]

1 Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan 430074, China
2 Université de Lorraine, CNRS, CRAN UMR 7039, Nancy 54000, France
3 Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Physics and Optoelectronic Engineering, Shenzhen University, Shenzhen 518060, China
4 Department of Radiology, University of Michigan, Ann Arbor, MI 48109-0553, USA
5 MOE Key Laboratory of Laser Life Science & Institute of Laser Life Science, College of Biophotonics, South China Normal University, Guangzhou 510631, China

Biomedical optics is an interdisciplinary subject of optics and life sciences. In recent years, as researches of life science have entered microscopic scale at cellular level, the application of optics in biomedical researches has been extensively studied. Biomedical optics can be divided into two major branches according to research purposes. One is to use advanced optical methods to obtain biomedical information, whose recent trend of development is high-speed *in vivo* imaging, such as super-resolution imaging [1], fluorescence imaging [2], optical coherence tomography [3], and photoacoustic imaging [4]. The other is to use the interaction of light and biological tissues for disease treatment, such as photodynamic therapy [5], whose recent trend of development is precise treatment. This special issue on “Biomedical Optics” includes two reviews and six research articles, covering most of the topics mentioned.

In this special issue, Cheng et al. [6] present an extended depth-of-field photoacoustic microscopy (E-DOF-PAM) system that can achieve a constant spatial resolution and relatively uniform excitation efficiency over a long axial range. Gong et al. [7] use stochastic optical reconstruction microscopy (STORM) to observe the tube-like structures of tunneling nanotubes (TNTs) linking live cells with an easily prepared fluorescent dye. The cleavage process of TNTs is observed with high spatial resolution. Huang et al. [8] summarize the preparation and performance of black phosphorus. Thereafter, black phosphorene-based multifunctional platforms employed for the diagnosis and treatment of diseases, including cancer, bone injuries, brain diseases, progressive oxidative diseases, and kidney injury, are reviewed in detail. Xu et al. [9] give a summary on the recent advances in cognitive functions in the optical and multimodal neuroimaging fields, including the processing of brain cognitive functions foundation during the circadian rhythm phase, how circadian rhythms affect the cognition component, as well as the brain circuit supporting the cognition. Yakovlev et al. [10] show the fluorescence diagnostics (FD) results of cholangiocellular cancer, which are obtained by modified optical fiber, and the results of photodynamic therapy (PDT) using a therapeutic laser. The authors find that it is possible to use a therapeutic laser with a wavelength of 660 nm for both diagnosis and treatment of bile ducts cancer, which significantly reduces the operation time without decreasing its effectiveness. Savelieva et al. [11] propose a spectrum-processing algorithm, which combines empirical and theory-based approaches, to correct the influence of optical properties on the photosensitizer concentration analysis by fluorescence spectroscopy. Maklygina et al. [12] find that, due to the specific metabolism in the glioma tissue and normal brain tissue, the crosstalk between tumor cells and immune cells of different geneses can be prevented by using 5-aminolevulinic acid (5 ALA)-induced protoporphyrin IX (PpIX) and methylene blue (MB) in fluorescent diagnostics. Ogien et al. [13] present the latest advances in line-field confocal optical coherence tomography (LCOCT) which allow the generation of either horizontal ($x \times y$) section images at an adjustable depth or vertical

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E-mails: dawnzh@hust.edu.cn (D. Zhu), walter.blondel@univ-lorraine.fr (W. Blondel), jlqu@szu.edu.cn (J. Qu), xdwang@umich.edu (X. Wang), yangsh@scnu.edu.cn (S. Yang)

($x \times z$) section images at an adjustable lateral position, as well as three-dimensional images.

These eight articles appeared in this special issue only cover a rather small portion of the recent advances in biomedical optics. We hope this special issue will provide useful references for biomedical optics community and motivate more investigations in these research fields.

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