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Translational Biophotonics

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For the second consecutive year, the Journal of Biomedical Optics is offering a collection of papers related to the growing area of research and development termed translational biophotonics. This special section is again in follow up to the SPIE BiOS Translational Research Symposium at Photonics West, which highlights research in biomedical optics aimed at clinically relevant science and technology development at various stages along the translation pipeline. Ongoing interest in these forums from a diverse group of international researchers conveys not only growing excitement about the potential for photonics technologies to impact clinical medicine, but also the need for sustained commitment to overcoming the many hurdles and challenges that prevent an idea in the lab from becoming a clinical reality. The collection presented here consists of 13 original articles published in the Journal of Biomedical Optics, Volume 22, Issue 12.

While encompassing many unique ideas and applications, these papers raise some common themes in the field of biophotonics. First, emerging optical methods continue to show promise in the area of surgical guidance and monitoring. Highlighted here are an innovative blue diode laser for excisional biopsy in the oral cavity (Gobbo et al.), a photoacoustic imaging approach for anatomic assessment in robotic surgery (Gandhi et al.), a new phantom for advancing fluorescence-guided tumor resection (Samkoe et al.), novel activatable antibody-based fluorophores for image-guided surgery (Obaid et al.), and the use of optical coherence tomography for tracking otitis media after surgical intervention (Monroy et al.).

Second, the role for spectroscopic imaging and sensing in cancer diagnostics also continues to evolve rapidly. New papers present important results from human patients using diffuse optical spectroscopic imaging (DOSI) to evaluate breast cancer in a 2-year study (Leproux et al.) and in a pilot study on bone sarcoma (Peterson et al.), a potential new application. The focus on breast cancer is further
strengthened with data on the use of near-infrared spectroscopy to predict tumor response to chemotherapy (Lee et al.), an assessment of tissue compression techniques to enhance the ability of spatial frequency domain imaging to visualize breast tumors (Robbins et al.), and a technique for improving diffuse optical tomography of the breast using ultrasound (Mostafa et al.).

Third, new compact and portable optical systems technology for the clinic (Nogueira et al. and Lee et al.) will enable new applications such as blood perfusion monitoring in reconstructive surgery (Lee et al.) and measurement of muscle changes in response to rehabilitation training (Warren et al.).

Translational research by nature demands a highly collaborative and multidisciplinary approach between scientists, engineers, and clinicians as well as between academic and industry partners. The process of matching a clinical need to a promising technology in the right patient population and iteratively optimizing and advancing this technology to bring it to the bedside challenges conventional departmental, funding, regulatory, and commercial boundaries. The papers in this special section demonstrate many points along this translation process and reinforce these concepts. The future growth and success of the field of biomedical optics will depend upon creative approaches to bridge the gaps along the translational pipeline. The guest editors hope that ongoing emphasis on translational research in the published literature and in scientific meetings such as Photonics West will engage more of the biophotonics community to debate, discuss, and collaborate going forward.

The guest editors wish to thank the authors who contributed to this special section as well as the many anonymous reviewers who dedicated their time and expertise to selecting the most promising papers. We also wish to thank Lihong Wang, the editor in chief of JBO, for his ongoing commitment to this series on Translational Biophotonics; Gwen Weerts, the managing editor for SPIE journals for her diligence and support; and the remaining JBO staff who helped get this issue across the finish line.

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