Journal of Biomedical Optics

BiomedicalOptics.SPIEDigitalLibrary.org

Translational biophotonics

Gabriela Apiou-Sbirlea
Conor L. Evans
Kristen M. Kelly
Bruce J. Tromberg

SPIE.

Gabriela Apiou-Sbirlea, Conor L. Evans, Kristen M. Kelly, Bruce J. Tromberg, "Translational biophotonics," *J. Biomed. Opt.* **21**(12), 124002 (2016), doi: 10.1117/1.JBO.21.12.124002.

Translational biophotonics

Gabriela Apiou-Sbirlea
Conor L. Evans
Massachusetts General Hospital Research Institute
Wellman Center for Photomedicine and Harvard Medical School
Department of Dermatology
40 Blossom Street, Boston, Massachusetts 02114, United States

Kristen M. Kelly
Bruce J. Tromberg
University of California Irvine
Beckman Laser Institute
1002 Health Sciences Road East
Irvine, California 92612, United States

The SPIE BiOS Translational Research Symposium at Photonics West was launched in 2014 (http://spie.org/conferences-and-exhibitions/photonics-west/translational-research) to feature innovative biophotonics and biomedical optics technologies and emphasize the unique challenges associated with moving research findings along the translation pipeline from fundamental science, to proof of concept, to development, and finally transfer to market and patient care.

This collection of papers in the *Journal of Biomedical Optics* is the first of a series that is intended to complement the Translational Research Symposium by providing archival peer-reviewed manuscripts that illustrate clinically relevant technologies and best practices that will accelerate the pace of translation to industry and clinical use, with the ultimate goal of providing better and affordable patient care.

This collection of papers comprises 12 original articles and 1 special commentary, which were published in the *Journal of Biomedical Optics* Volume 21, Issues 6–12:

R. E. Wijesinghe et al., "In vivo imaging of melanoma-implanted magnetic nanoparticles using contrast-enhanced magneto-motive optical Doppler tomography," *J. Biomed. Opt.* **21**(6), 064001 (2016).

Leproux et al., "Differential diagnosis of breast masses in South Korean premenopausal women using diffuse optical spectroscopic imaging," *J. Biomed. Opt.* **21**(7), 074001 (2016).

D. J. Waterhouse et al., "Design and validation of a near-infrared fluorescence endoscope for detection of early esophageal malignancy," *J. Biomed. Opt.* **21**(8), 084001 (2016).

M. Maclaughlin et al., "Porphysome nanoparticles for enhanced photothermal therapy in a patient-derived orthotopic pancreas xenograft cancer model: a pilot study," *J. Biomed. Opt.* **21**(8), 084002 (2016).

K. Hope et al., "Evaluating the effect of local pH on fluorescence emissions from oral bacteria of the genus Prevotella," *J. Biomed. Opt.* **21**(8), 084003 (2016).

R. Farraro et al., "Handheld, point-of-care laser speckle imaging," *J. Biomed. Opt.* **21**(9), 094001 (2016).

M. Jermyn et al., "Neural networks improve brain cancer detection with Raman spectroscopy in the presence of operating room light artifacts," *J. Biomed. Opt.* **21**(9), 094002 (2016).

M. L. Phipps et al., "Super-resolution optical microscopy study of telomere structure," *J. Biomed. Opt.* **21**(9), 094003 (2016).

M. J. Gora et al., "Tethered capsule endomicroscopy: from bench to bedside at a primary care practice," *J. Biomed. Opt.* **21**(10), 104001 (2016).

Regan et al., "Design and evaluation of a miniature laser speckle imaging device to assess gingival health," *J. Biomed. Opt.* **21**(10), 104002 (2016).

S. J. Leavesley et al., "Hyperspectral imaging fluorescence excitation scanning for colon cancer detection," *J. Biomed. Opt.* **21**(10), 104003 (2016).

Vasefi et al., "Separating melanin from hemodynamics in nevi using multimode hyperspectral dermoscopy and spatial frequency domain spectroscopy," *J. Biomed. Opt.* **21**(11), 114001 (2016).

H. N. Xu et al., "Optical redox imaging indices discriminate human breast cancer from normal tissues," *J. Biomed. Opt.* **21**(11), 114003 (2016).

B. J. Tromberg et al., "Biomedical optics centers: forty years of multidisciplinary clinical translation for improving human health," *J. Biomed. Opt.* **21**(12), 124001 (2016).

These original manuscripts highlight diverse, ongoing, and promising research efforts and applications with a special focus on novel methods and devices that are aimed to prevent, diagnose, or treat a wide range of cancers (brain, breast, esophagus, pancreas, colon, skin) with minimal or no associated morbidity. They report exciting results in areas such as detecting invasive brain cancer cells by coupling artificial neural networks with Raman spectroscopy (Jermyn et al.), distinguishing between malignant and benign lesions in breast cancer by using diffuse optical spectroscopic imaging (Leproux et al.), screening for Barrett's esophagus by using optical coherence tomography in primary care practice (Gora et al.), or performing laser speckle–based point-of-care measurements of blood flow (Farraro et al.). The authors address key aspects involved in navigating the translational pipeline, such as identifying clinical problems and unmet

clinical needs, describing barriers to clinical translation, disseminating and adopting new technologies, and developing sound measures to assess efficacy.

The commentary paper (Tromberg et al.) identifies common essential features for successful translation by examining the origins and critical paths of three major international academic affiliated centers, founded mid-late 1970s.

The objective of both the symposium and this series is to enable a new generation of biomedical scientists to pursue translational research careers, to encourage the emergence and growth of successful translation-oriented initiatives that will not only sustain, but also further increase the impact of biophotonics and biomedical optics on human health.

The guest editors would like to thank all authors for their excellent contributions as well as the reviewers from all over the world for their high-quality work and commitment to making this special series a success. The guest editors would also like to express their gratitude to Lihong Wang, editor-in-chief of JBO, for giving our community this unique opportunity; Gwen Weerts, managing editor for SPIE journals for her continuous support and attention; and the JBO staff who helped complete this series every step of the way.

Gabriela Apiou-Sbirlea, PhD, is an assistant professor at Harvard Medical School, director of Translational Research Core at Wellman Center for Photomedicine and of Translation Research Training and Development at Mass General Research Institute. She received her PhD degree in biomedical engineering and Habilitation a Diriger des Recherches (HDR) in France. She has over 20 years experience in performing and directing biomedical research in both industry and academia internationally.

Conor L. Evans, PhD, is an assistant professor at Harvard Medical School and runs a research laboratory at the Wellman Center for Photomedicine dedicated to the development and translation of optical technologies for disease diagnostics and therapeutics. His research interests include the development of advanced microscopy technologies to investigate and follow treatment response, oxygen-sensing "smart" bandage technologies, and ultrasensitive detection methods for cancer diagnostics and immunoncology.

Kristen M. Kelly, MD, is a professor of dermatology and surgery at the University of California, Irvine, and vice-chair of the UC Irvine Department of Dermatology. She has more than 20 years of experience in basic science and clinical translational research focusing on development and use of light-based technologies for diagnosis and treatment of disease, especially cutaneous vascular lesions and skin cancer.

Bruce J. Tromberg, PhD, is a professor of biomedical engineering and surgery at the University of California, Irvine (UCI), and director of UCI's Beckman Laser Institute and Medical Clinic. He has more than 25 years of experience in the development of optics and photonics technologies and their application to biology and medicine. His research interests are in the development of quantitative broadband biophotonics technologies for characterizing and imaging tissue structure, function, and composition across spatial scales.