

WELCOME to the IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS (JSTQE) Issue on Biophotonics. Biophotonics is a truly exciting multidisciplinary field as it combines state-of-the-art photonics technologies in quantum electronics, lasers, fiber optics, and electro-optics to the study of life sciences and medicine. Since the invention of the microscope, light has played a crucial role in the discovery of phenomena in all forms of life, from single-celled organisms to humans. The modern field of biophotonics represents a truly broad spectrum of research spanning from basic science studies in botany and zoology, to biomedicine and clinical technologies. Yet, all of these research themes have in common the use of photons on living cells and organisms, which leads to insights being shared and used to inspire new directions across the spectrum of applications. In the biomedical domain, biophotonics approaches often initiate at the “bench,” where promising technologies eventually lead to clinically relevant “bedside” diagnostics and therapeutics. Because of the low cost associated with biomedical technologies, and increasing use of integrated photonics in mobile technologies, this field is rapidly transforming our approach to health care by providing increasingly rapid, accurate, point-of-care, and cost-efficient diagnostics and surgical guidance techniques.

The purpose of this issue of JSTQE is to highlight the recent progress and trends in the development of leading-edge photonic technologies that address current challenges in biology and medicine. This issue presents a wide variety of novel and emerging optically based technologies that push the current capabilities of sensing, metrology, and imaging in biological environments.

This issue contains 46 papers, including 13 invited papers authored by well-regarded research groups, both established and emerging, from all over the world. The invited papers include extended reviews on biophotonic technology development and applications in the areas of photoacoustic imaging, diffuse optical spectroscopy, optical coherence tomography and elastography, computed optical imaging, novel imaging strategies using ultrafast spectroscopy, laser speckle imaging, mechanisms of low-light therapy, microscopy in low-resource settings, and spectroscopy for forensic applications. The contributed papers cover a broad variety of existing and new biophotonic topics including optical tweezers, photodiode technology development, functional and intraoperative capabilities using diffuse optical spectroscopy, selective disinfection of cell cultures, and monitoring of radiation and drug therapies, to name a few. Of particular note is a significant increase in the number of publications in photoacoustics and optical elastography this year, fields which are of rapidly growing interest in the biomedical imaging technology community.

We hope you will find this JSTQE Issue on Biophotonics to be an interesting and thought-provoking reference that will inspire and impact future advances in biophotonics.

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This issue was made possible by the dedicated efforts of a number of people. First, we thank the many reviewers who volunteered their time and effort to provide in-depth reviews, leading to stimulating scientific discourse and the improvement of many of the manuscripts published in this issue. The continued high quality of IEEE publications and biophotonics research as a whole greatly depend on their ongoing and selfless efforts. Second, this issue would not have been possible without the guidance and help of C. T. Lutz of the IEEE Photonics Society staff, whose excellent organizational skills helped us to meet the deadlines. We also thank Prof. L. Lester, Editor-in-Chief of JSTQE, for his guidance and encouragement in assembling this issue. Finally, we thank the many authors for their invited and contributed papers, their patience during the review process, and the excellent quality of their research that have provided a stimulating Issue on biophotonics in 2016.



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Dr. Chen received NSF CAREER Award in 2012. He has been an Associate Editor of *Medical Physics* and a Guest Editor of IEEE JOURNAL OF SELECTED TOPICS ON QUANTUM ELECTRONICS and the *SPIE Journal of Neurophotonics*. He is a Member of SPIE and the Optical Society of America (OSA) and has served as a Conference Program Chair and General Chair for OSA Conference on Lasers and Electro-Optics: Applications and Technologies.



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Jannick Rolland received the Optical Engineering diploma degree from the Institut D'Optique Théorique et Appliqué, Palaiseau, France, and the M.S. and Ph.D. degrees in optical science from the College of Optical Sciences, University of Arizona, Tucson, AZ, USA.

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Prof. Rolland is a Fellow of OSA, SPIE, and NYSTAR. She served as the Director at Large on the OSA Board of Directors 2010–2013. She received the 2014 OSA David Richardson Medal for “*Visionary Contributions and Leadership in Optical Design and Engineering, Enabling Noninvasive, Optical Biopsy.*” Her research interests include focus on optical engineering innovations in relation to imaging and visualization across a wide range of driving applications.



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Dr. Tunnell has received the following awards/honors: South-by-Southwest Interactive Award (2015), Fellow of the American Institute of Medical and Biological Engineers—AIMBE (2015), Best Paper in the Biomedical Engineering Division - America Society for Engineering Education (2012), Outstand BME Graduate Alumnus from Rice University (2010), Coulter Fellow (2010), “20 Greatest Inventions of the Next Decade,” *Business Week* (2009), Ralph E. Powe Junior Faculty Enhancement Award from the Oak Ridge Associated Universities (2007), Early Career Award from the Wallace H. Coulter Foundation (2008, 2006), National Research Service Award from the NIH (2004), and Best Basic Science Paper from the American Society for Laser Medicine and Surgery (2000). He received the National Research Service Award from the NIH to fund his postdoctoral fellowship in the Spectroscopy Laboratory at the Massachusetts Institute of Technology from 2003–2005. He is a Member of the OSA, ASLMS, and BMES.