Journal of Biomedical Optics

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Advanced Biomedical Imaging and Sensing

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Biomedical imaging and sensing, a major part of biophotonics, are now a research focus not just in academics, but also in industry. This research aims to develop novel technologies for interrogating molecular events in living objects, to understand molecular phenomena in diseases such as cancer, cardiovascular diseases, and neurology diseases, and to accelerate much-needed new discoveries in biology and medicine. With a strong industry in electronics and photonics, development of the advanced biomedical imaging and sensing technology will strengthen future industry development toward health care and biomedical technologies.

Supported by National Science Council of the Republic of China, the Taiwan Photonics Society, and National Taiwan University, the Optics and Photonics Taiwan, the International Conference (OPTIC2012) and the Biomedical Molecular Imaging 2012 Conference were held in Taipei and New Taipei during 6-8 December 2012 and 10-11 December 2012, respectively. They brought together local and international scholars to present and discuss the advancement in biophotonics and molecular imaging technologies. A special emphasis was on the translational biomedical imaging and sensing technique for interrogating molecular events in living objects, including human, and thereby facilitating the biophotonics industry in Taiwan.

We have selected 19 papers for publication in this special section of the *Journal of Biomedical Optics*. Most of these were selected from the works presented at the conferences in Taiwan, but contributed papers whose subjects fall into the scope were also included. The topics include:

- Biomedical imaging techniques, including OCT, nonlinear microscopy, confocal microscopy, Raman imaging, hyperspectral fluorescence microscopy, functional optical topography, and optical diffraction tomography
- Novel optical probes
- Molecular sensing
- Microrheology, optical tweezers, and optical patterning
- Laser-induced fluorescence/Raman spectroscopy.

Among all these papers, it is worth mentioning that in the invited paper [*J. Biomed. Opt.* **19**(1), 011016 (2014)], M. Ando and H. Hamaguchi review the molecular component distribution imaging of living cells by multivariate curve resolution analysis. They show that label-free Raman microspectroscopy combined with a multivariate curve resolution analysis can be a powerful tool for studying a wide range of biomedical molecular systems. The principles of the MCR-ALS analysis

are reviewed with a model system of titanium oxide crystal polymorphs, followed by two examples of *in vivo* Raman imaging studies of living yeast cells, fission yeast, and budding yeast. The MCR-ALS technique also resolves broadly overlapped OH stretch Raman bands of water, clearly indicating the existence of organelle-specific water structures in a living budding yeast cell.

All authors who contributed papers to this special section bring their unique contribution to advance the field of biomedical imaging and sensing. We would like to thank the editor-in-chief, Lihong Wang, the journal support staff, the authors, and the reviewers for their invaluable effort and devotion.

Chi-Kuang Sun received his PhD degree in applied physics from Harvard University in 1995 and was an assistant researcher in the UCSB QUEST Center from 1995 to 1996. In 1996, he joined National Taiwan University, where he is now a distinguished professor of photonics and optoelectronics and the chief director of the Molecular Imaging Center. His research focuses on nanoacoustics, femtosecond optics, terahertz optoelectronics, and biomedical imaging. He is a fellow of OSA, SPIE, and IEEE.

Arthur Chiou received his PhD in applied physics from the California Institute of Technology. He is currently a professor of the Institute of Biophotonics, and the Director of the Biophotonics & Molecular Imaging Research Center (BMIRC) at National Yang-Ming University, Taipei, Taiwan. He is a Fellow of SPIE, OSA, and PSC. He was a recipient of the SPIE 1989 Rudolph Kingslake Award and Medal and the 2008 ROC Optical Engineering Society Award and Medal.

Fu-Jen Kao received his PhD degree in physics from Cornell University in 1993. He joined National Sun Yat-sen University from 1993 to 2004 and pioneered the developments of multiphoton microscopy in Taiwan. In 2004, he moved to National Yang-Ming University and helped to establish the Institute of Biophotonics, the first of its kind in Taiwan. His research focuses on optical microscopy, photonic physics, and medical photonics. He is currently the vice president of the Physical Society in Taiwan.

Chien Chou received his PhD degree from the Optical Sciences Center, University of Arizona, in 1978. Currently, he is professor of the Graduate Institute of Electro-optical Engineering, Chang Gung University, Taiwan. His current research includes localized surface plasmon biosensors, near-infrared spectroscopy (NIRS), and dynamic light scattering (DLS).

Chen Yuan Dong received his PhD from the University of Illinois at Urbana under Enrico Gratton. After spending more than two years at MIT as NIH Postodctoral Fellow with Peter So, he joined the Department of Physics at National Taiwan University where he is now a professor. His research includes the development of multiphoton techniques and relevant applications in biology and medicine. He is on the editorial board of the *Journal of Biomedical Optics* and a Fellow of OSA.