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Multiphoton Microscopy in the Biomedical Sciences XV

Ammasi Periasamy

Peter T. C. So

Karsten König

Editors

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Introduction

Multiphoton microscopy has been established as the 3D imaging method of choice for studying biomedical specimens from single cells to whole animals with sub-micron resolution. Two decades have passed since the realization of two-photon laser scanning microscopy. The ever-expanding scope of applications and the continuing instrumental innovations require a forum where new ideas can be exchanged and presented. Our conference at the SPIE BIOS 2015 meeting continues to address this need.

This was the 15th year of this conference and we started our conference with three keynote lectures from leaders in the field: Drs. Paras N. Prasad, Univ. at Buffalo (United States) [9329-1], Francesco S. Pavone, European Lab. for Non-linear Spectroscopy (Italy) [9329-2], and Wolfgang Becker, Becker & Hickl GmbH (Germany) [9329-3].

For the 4th year in a row, the conference was extremely pleased to have the JenLab Young Investigator Award in addition to our regular poster awards. This award was donated by Dr. Karsten König, President and Founder of JenLab GmbH (Germany). The award selection committee included Drs. Arnd Krueger, Newport-Spectra Physics (United States); Conor Evans, Harvard Univ. (United States); Alberto Diaspro, Istituto Italiana di Tecnologia (Italy); and two of the conference chairs, Karsten König and Ammasi Periasamy. The selection process included the abstract, manuscript, and poster presentation. Two finalists were selected for oral presentation after their poster presentation. The two finalists were (1) Mr. Kirby R. Campbell from Univ. of Wisconsin-Madison (United States), for "Determination of the spectral dependence of reduced scattering and quantitative SHG imaging for detection of fibrillary changes in ovarian cancer" [9329-79] and (2) Ms. Yi Xue from Massachusetts Institute of Technology, Boston, Massachusetts (United States), for "Parallel and flexible imaging using two-photon RESOLFT microscopy with spatial light modulator control" [9329-76]. **Ms. Yi Xue** from Massachusetts Institute of Technology, Boston, Massachusetts (United States) was selected as the **winner of the JenLab Young Investigator Award 2015.**

For 15 years in a row, the conference organized poster awards for the students and postdoctoral fellows. The poster award was donated by all the conference sponsors including: Becker & Hickl, Chroma Technology, Coherent, ISS, Spectra-Physics, Princeton Instruments, Leica Microsystems, Semrock (IDEX), Veroptics and Carl Zeiss.

The 4 poster award winners were:

1. Charles-André Couture, Institut National de la Recherche Scientifique (Canada): "Interferometric second harmonic generation imaging of biological tissues" [9329-75]
2. Dapeng Zhang, The Chinese Univ. of Hong Kong (Hong Kong, China): "Multi-photon laser scanning omnidirectional imaging with tunable frame rate" [9329-89]
3. Joe T. Sharick, Vanderbilt Univ. (United States): "Monitoring metabolic enzyme activity in cells with fluorescence lifetime imaging of NAD(P)H" [9329-107]

4. Alexander D. Corbett, Univ. of Oxford (United Kingdom): "Imaging cardiomyocytes in intact tissue with a remote focusing microscope" [9329-114]

Some of the most valuable contributions in this volume are articles written by highly experienced practitioners of multiphoton microscopy. They have enumerated the most important considerations in designing multi-photon microscopes and imaging experiments. Further, updates on the state-of-the-art commercial multiphoton microscope systems are presented. This volume also includes articles describing some recent advances in major multiphoton microscope components and applications including laser light sources, ultrafast optics, filters, FRET, FLIM, FCS, Raman, CARS, SRS and CRS microscopy and spectroscopy, single molecule, super-resolution imaging, endoscopy, and various scientific and clinical applications.

On a personal note, the conference chairs are grateful for the participation of all authors and session chairs; and acknowledge the innovation-driven manufacturers and sponsors of this conference (Becker & Hickl, Chroma Technology, Coherent, ISS, Spectra-Physics, Princeton Instruments, Leica Microsystems, Semrock (IDEX), Veroptics, Carl Zeiss, and JenLab) for their enthusiastic support in organizing this conference successfully for the last 15 years. We look forward to other exciting conferences in the second decade and welcome your continued participation and support.

**Ammasi Periasamy
Karsten König
Peter T. C. So**

Congratulations to the 2014 Nobel Laureates in Chemistry

One personal note to the Fluorescence Microscopy Community: We were all delighted and congratulated the 2014 Nobel Laureates in Chemistry at the Photonics West 2015 BIOS in a special plenary session on Nobel award on 8 February 2015. This is the first time the SPIE organization celebrated the Nobel award in a special plenary session. Three scientists' shared the 2014 Nobel award for their achievements in super resolution microscopy:

Dr. Eric Betzig from Janelia Farm, Howard Hughes Medical Institute, Ashburn, Virginia (United States), for his achievement in Photoactivated Localization Microscopy (PALM).

Dr. Stefan W. Hell from Max-Planck-Institut für biophysikalische Chemie (Germany), for his achievement in Stimulated Emission Depletion (STED) microscopy.

Dr. William E. Moerner (WE) from Stanford Univ., California (United States), for his achievement in single molecule detection.

All the 'buzz' of the Nobel award was about that "Living Room", where Eric Betzig built the PALM microscopy imaging system in his friend's (Dr. Harald Hess) home. Eric Betzig dedicated his Nobel lecture about super-resolution optics to "all people taking risks but in the end failed". William Moerner mentioned that a single molecule is extremely small, which he was able to detect using various techniques. Stefan Hell also discovered in his journey to the award that it is possible to overcome the generally accepted resolution barrier. There is nothing that is impossible in science. All three have presented other scientific work in this conference at various times. Stefan Hell for example gave two memorable keynote lectures at this multiphoton conference during 2005, "Fluorescence nanoscopy through reversible optically saturable transitions" [5700-01], and again in 2010, "Nanoscopy with focused light" [7569-02].

The editors wish to congratulate the 2014 Nobel Laureates in Chemistry for their achievements in super-resolution microscopy.