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Editors

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Introduction

Multiphoton microscopy has been established as the 3D imaging method of choice for studying living biomedical specimens from single cells and whole animals to patients with sub-micron resolution. 29 years 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 BIOS2019 meeting continues to address this need.

This was the 19th year of this conference and we started our conference with four Keynote lectures from leaders in the field of metabolism:

(1) **Alberto Diaspro,** Istituto Italiano di Tecnologia (Italy), "Multi messenger multiphoton microscopy"
(2) **Ji-Xin Cheng,** Boston Univ. (United States), **"**Highly sensitive chemical microscopy by sensing the thermal effect of infrared absorption"
(3) **Xingde Li,** Johns Hopkins Univ. (United States), "Nonlinear endomicroscopy for label-free histological imaging in vivo"
(4) **Ammasi Periasamy,** Univ. of Virginia (United States), "FLIM, FRET and FLIRR assay for investigating the mitochondrial redox state in cancer cells."

For the 7th year, we were extremely pleased to have the JenLab Young Investigator Award, in addition to our regular poster awards. JenLab Young Investigator Award is sponsored by JenLab GmbH (Germany). The award selection committee included Drs. Arnd Krueger, Spectra Physics, a division of MKS Instruments (United States), Paul Campagnola, University of Wisconsin-Madison (United States), Conor Evans, Massachusetts General Hospital (United States), Alberto Diaspro, Istituto Italiano di Tecnologia (Italy), Holly Aaron, University of California at Berkeley (United States), and the three conference chairs (Ammasi, Karsten and Peter). The selection process reviewed seven abstracts, manuscripts and five-minute oral presentations. Two finalists were selected for 15-minute oral presentation after their five-minute oral presentation. The two finalists were:

(1) **Yide Zhang,** Univ. of Notre Dame (United States), **"**Three-dimensional deep tissue multiphoton frequency-domain fluorescence lifetime imaging microscopy via phase multiplexing and adaptive optics"
(2) **Haonan Lin,** Boston University (United States), "Spectroscopic stimulated Raman scattering microscopy by ultrafast delay line tuning and deep learning."

The review panel selected **Dr. Yide Zhang,** Univ. of Notre Dame (United States)**,** as the winner of the JenLab Young Investigator Award 2017**.** The winner received a certificate and $1500. The runner-up received $500 award. The award was presented by Prof. Dr. Karsten König, Saarland University (Germany), and President and Founder of JenLab GmbH (Germany).

For 19 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 as acknowledged at the bottom of the page. The review panelists were, Holly Aaron, University of California at Berkeley (United States), Lingyan Shi, Columbia University (United States), Michael Börsch, Universitätsklinikum Jena (Germany), and Conor Evans, Massachusetts General Hospital (United States).

The 4 poster award winners were:

(1) **Hyeon Jeong Lee,** Boston Univ. (United States), "Pre-resonance stimulated Raman scattering spectroscopy and imaging of membrane potential using near-infrared rhodopsins"
(2) **Alexander Fast,** Massachusetts General Hospital (United States), "Multimodal microscopy toolkit for visualizing multicomponent topical drug formulations in humans"
(3) **Ruofan Kao,** University of Virginia (United States), "FLIM imaging of auto-fluorescent NAD(P)H and FAD to track metabolic changes of non-adherent leukemia cells using microfluidic trapping array"
(4) **Jan Philip Kolb,** Medizinisches Laserzentrum Lübeck GmbH (Germany), "Virtual H&E histology by fiber-based picosecond two-photon microscopy."

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 multiphoton 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, ultra-fast optics, filters, FRET, FLIM, FCS, Raman, CARS, SRS and Coherent Raman microscopy and spectroscopy, single molecule, endoscopy, In vivo/Intravital imaging, metabolism measurements including NADH, FAD, tryptophan in cells and tissues and various scientific and clinical applications.

On a personal note, the conference chairs are grateful for the participation of all authors, session chairs and acknowledge the innovation-driven manufacturers and sponsors of this conference [Applied Scientific Instruments (ASI), Becker & Hickl, Carl Zeiss. Chroma Technology, Coherent, ISS Inc., Excelitas Technologies, JenLab, Leica Microsystems, PicoQuant, Semrock (IDEX), and Spectra Physics-a division of MKS Instruments] for their enthusiastic support in organizing this conference successfully for the last 19 years. We look forward to other exciting conferences in the future and welcome your continued participation and support.

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Peter T. C. So
Karsten König