

# ***Multiphoton Microscopy in the Biomedical Sciences XII***

**Ammasi Periasamy**

**Karsten König**

**Peter T. C. So**

*Editors*

**22–24 January 2012**

**San Francisco, California, United States**

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SPIE

**Volume 8226**

Proceedings of SPIE, 1605-7422, v. 8226

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Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Multiphoton Microscopy in the Biomedical Sciences XII*, edited by Ammasi Periasamy, Karsten König, Peter T. C. So, Proceedings of SPIE Vol. 8226 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN 1605-7422

ISBN 9780819488695

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

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JenLab Young Investigator Award

**Ammasi Periasamy**, University of Virginia (United States)  
**Karsten König**, JenLab GmbH (Germany) and Saarland University  
(Germany)

Keynote Session

**Ammasi Periasamy**, University of Virginia (United States)

- 1 FRET, FLIM, FCS I  
**Angelika C. Rueck**, Universität Ulm (Germany)
- 2 FRET, FLIM, FCS II  
**Steven S. Vogel**, National Institutes of Health (United States)
- 3 FRET, FLIM, FCS III  
**Karsten König**, JenLab GmbH (Germany) and Saarland University  
(Germany)
- 4 Technology Development and Applications I  
**Peter T. C. So**, Massachusetts Institute of Technology (United States)
- 5 Technology Development and Applications II  
**Richard N. Day**, Indiana University (United States)
- 6 Harmonic Generation Microscopy I  
**Chen-Yuan Dong**, National Taiwan University (Taiwan)
- 7 Harmonic Generation Microscopy II  
**Paul J. Campagnola**, University of Wisconsin-Madison (United States)
- 8 Hyperspectral Imaging with CRS  
**X. Sunney Xie**, Harvard University (United States)
- 9 Applications of CRS Microscopy  
**Ji-Xin Cheng**, Purdue University (United States)
- 10 CRS for Medical Diagnostics  
**Annika M. Enejder**, Chalmers University of Technology (Sweden)
- 11 Fiber Laser Technology for CRS  
**Eric O. Potma**, University of California, Irvine (United States)

- 12    **Advanced CRS Microscopy Instrumentation**  
      **Christian W. Freudiger**, Harvard University (United States)

Poster Session

**Aisada Uchugonova**, Saarland University (Germany)

**Holly L. Aaron**, University of California, Berkeley (United States)

**Michael Börsch**, Universität Stuttgart (Germany)

**Conor L. Evans**, Wellman Center for Photomedicine (United States)

**Paul J. Campagnola**, University of Wisconsin-Madison (United States)

**Kevin W. Eliceiri**, University of Wisconsin-Madison (United States)



## Introduction

The multiphoton microscopy has been established as the 3-D 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 microscopy, and the ever-expanding scope of applications and the continuing instrumental innovations require a forum where new ideas can be exchanged and presented. Our conference, originally in the SPIE BIOS2001 meeting, continues to address this need.

We started the conference in 2001 and for few years the total number of abstracts on the average was about 45. As we enter into the 12th year of the conference, the abstract total numbers has grown to 150. This is possible because of the various factors including great interest in the multiphoton excitation fluorescence microscopy, technology advances in lasers, optics, and support and encouragement from various sponsors (vendors) of the conference, and more importantly, transformation of the multiphoton technology from bench to bed.

This year we started our conference with three keynote lectures from the leaders in the field: Drs. Scott Fraser from California Institute of Technology, USA; Paul French, Imperial College London, UK; and Enrico Gratton, Laboratory for Fluorescence Dynamics, University of California Irvine, USA [822609].

This year the conference enjoyed introducing the JenLab Young Investigator Award in addition to our regular poster awards. This award was donated by Prof. Karsten König, President and Founder of JenLab GmbH, Germany. The award selection committee includes Drs. Arnd Krueger (NewPort-Spectra Physics), Conor Evans (Harvard Univ), Paul Campagnola (Univ. of Wisconsin), and the three conference chairs. The selection process includes the abstract, manuscript, and poster presentation. Two finalists are selected for oral presentation after the poster presentation. The two finalists are (1) Dr. Hod Dana, Faculty of Biomedical Engineering, Technion – Israel Institute of Technology, Haifa 32000, Israel [822603] (2) Dr. Jesse W. Wilson, Duke University, French Family Science Center, Durham, NC, USA [822602]. Dr. Dana has demonstrated how the line-illuminating temporal-focusing microscope could enable rapid three-dimensional imaging at 10-20 volumes/sec, and he characterized the system with theory and experimental verification. On the other hand, Dr. Wilson demonstrated an in vivo optical microscope that utilizes pump-probe spectroscopy to image the distribution of the two forms of melanin in skin and compared simultaneously with other non-invasive laser microscopy methods (confocal reflectance, multiphoton autofluorescence, and second harmonic generation) allowed him to visualize architecture of the skin with potential application in melanoma diagnosis.

Dr. Jesse Wilson from Duke University was selected as the winner of the JenLab Young Investigator Award 2012. Please visit the SPIE.org URL to see the award winning pictures.

The four poster award winners are Amanda Siegel (Indiana University, USA), Gael Latour (Ecole Polytechnique, France) [82262I], Po-Yen Lin (National Yang-Ming University, Taipei, Taiwan) [82262T], and Evelien De Meulenaere, Katholieke Universiteit Leuven (Belgium) [82263C].

This proceeding allows the presenters to provide a more in-depth discussion of their subject. 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 the 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 source, the ultra-fast 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.

The series of excellent papers in these proceedings over the past decade is a sign of the vitality in the multiphoton microscopy field. We have deliberately avoided mentioning any author by name because we believe that it would be inappropriate for us to direct the readers to any particular paper(s). As the field progresses, controversies and conflicts among researchers in this field are unavoidable. We believe that this series of proceeding papers should serve as a forum where the authors can voice controversial opinions. Unlike archival journal papers, the editors of this proceeding series intentionally leave in controversial papers. It should be noted that the publication of these papers in this proceedings do not imply the scientific approval of the editors or SPIE as an organization. Further, we believe that this series should serve as a forum for civilized scientific exchange of ideas in various technology developments and applications. The editors reserve the right to reject any paper without a primary goal of disseminating scientific or engineering knowledge or that is deemed to breach the necessary civility.

On a personal note, the conference chairs are grateful for the participation of all authors, and acknowledge the vendors (Becker & Hickl GmbH, Boston Electronics, Carl Zeiss, Chroma Technology, Coherent, JenLab GmbH, Leica Microsystems, MultiPhoton Laser Technologies, Newport-Spectra Physics, Omega Optical, and Semrock) for their enthusiastic support in organizing this conference successfully for the last 11 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. S. So**

# **JenLab Young Investigator Award**

*Session Chair*

Dr. Ammasi Periasamy, University of Virginia, Charlottesville

***The Winner***

**Dr. Jesse W. Wilson**

Duke University, Durham, North Carolina

**Best Research Paper:**

***In-vivo pump-probe microscopy of melanoma and pigmented lesions***

**822602**

*The Award Presenter*

Dr. Karsten König

President of JenLab GmbH, Germany

