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Front Matter: Volume 8226

, "Front Matter: Volume 8226," Proc. SPIE 8226, Multiphoton Microscopy in the Biomedical Sciences XII, 822601 (15 March 2012); doi: 10.1117/12.931290

Event: SPIE BiOS, 2012, San Francisco, California, United States

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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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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The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

xi	Conference Committee
xv	Introduction
xvii	JenLab Young Investigator Award

JENLAB YOUNG INVESTIGATOR AWARD

8226 02	In vivo pump-probe microscopy of melanoma and pigmented lesions [8226-83] J. W. Wilson, S. Degan, T. Mitropoulos, M. A. Selim, J. Y. Zhang, W. S. Warren, Duke Univ. (United States)
8226 03	Rapid volumetric temporal focusing multiphoton microscopy of neural activity: theory, image processing, and experimental realization [8226-82] H. Dana, A. Marom, N. Kruger, A. Ellman, S. Shoham, Technion-Israel Institute of Technology (Israel)
8226 04	Second-harmonic generation and fluorescence lifetime imaging microscopy through a rodent mammary imaging window [8226-85] P. A. Young, Univ. of Wisconsin, Madison (United States); M. Nazir, M. J. Szulczewski, Prairie Technologies, Inc. (United States); P. J. Keely, K. W. Eliceiri, Univ. of Wisconsin, Madison (United States)
8226 05	Background-free nonlinear microspectroscopy with vibrational molecular interferometry [8226-86] E. T. Garbacik, J. P. Korterik, C. Otto, Univ. Twente (Netherlands); S. Mukamel, Univ. of California, Irvine (United States); J. L. Herek, H. L. Offerhaus, Univ. Twente (Netherlands)
8226 06	Stimulated Raman scattering microscopy by spectral focussing and fiber-generated soliton as Stokes pulse [8226-87] E. R. Andresen, P. Berto, S. Saint-Jalm, H. Rigneault, Institut Fresnel, CNRS, Aix-Marseille Univ. (France)

KEYNOTE SESSION

8226 09	In vivo deep tissue fluorescence imaging of the murine small intestine and colon (Invited Paper) [8226-03] V. Crosignani, A. Dvornikov, J. S. Aguilar, C. Stringari, R. Edwards, Univ. of California, Irvine (United States); W. Mantulin, E. Gratton, Univ. of California, Irvine (United States) and Beckman Laser Institute and Medical Clinic (United States)
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FRET, FLIM, FCS I

8226 0B	Dynamic nuclear protein interactions investigated using fluorescence lifetime and fluorescence fluctuation spectroscopy (Invited Paper) [8226-05] A. P. Siegel, N. M. Hays, R. N. Day, Indiana Univ. School of Medicine (United States)
---------	---

- 8226 0C **Spatially resolved recording of transient fluorescence-lifetime effects by line-scanning TCSPC (Invited Paper)** [8226-06]
W. Becker, B. Su, A. Bergmann, Becker & Hickl GmbH (Germany)
- 8226 0D **Phasor FLIM metabolic mapping of stem cells and cancer cells in live tissues** [8226-07]
C. Stringari, P. Donovan, E. Gratton, Univ. of California, Irvine (United States)
- 8226 0E **Fluorescence lifetime imaging microscopy (FLIM) studies of living primary human cells for applications in tissue regeneration** [8226-08]
W. R. Lloyd, L.-C. Chen, S. Kuo, C. L. Marcelo, S. E. Feinberg, M.-A. Mycek, Univ. of Michigan (United States)

FRET, FLIM, FCS II

- 8226 0G **Multiwavelength FLIM: new concept for fluorescence diagnosis (Invited Paper)** [8226-10]
A. Rück, S. Lorenz, C. Hauser, S. Mosch, S. Kalinina, Institute for Laser Technologies in Medicine and Metrology (Germany)
- 8226 0H **Clinical multiphoton FLIM tomography (Invited Paper)** [8226-11]
K. König, JenLab GmbH (Germany) and Saarland Univ. (Germany)
- 8226 0I **Monitoring transient elastic energy storage within the rotary motors of single F₀F₁-ATP synthase by DCO-ALEX FRET** [8226-12]
S. Ernst, Univ. Stuttgart (Germany) and Jena Univ. Hospital (Germany); M. G. Düser, N. Zarrabi, Univ. Stuttgart (Germany); M. Börsch, Univ. Stuttgart (Germany) and Jena Univ. Hospital (Germany)
- 8226 0J **Three-color FRET expands the ability to quantify the interactions of several proteins involved in actin filament nucleation** [8226-13]
H. Wallrabe, Univ. of Virginia (United States) and Keck Ctr. for Cellular Imaging, Univ. of Virginia (United States); Y. Sun, Univ. of Virginia (United States); X. Fang, A. Periasamy, G. Bloom, Keck Ctr. for Cellular Imaging, Univ. of Virginia (United States)

FRET, FLIM, FCS III

- 8226 0O **Ion-beam sputtered (IBS) thin-film interference filters for nonlinear optical imaging** [8226-18]
N. Anderson, P. Prabhat, T. Erdogan, Semrock Inc. (United States)
- 8226 0R **Pulse shaping multiphoton FRET microscopy** [8226-21]
M. H. Brenner, D. Cai, S. R. Nichols, Univ. of Michigan (United States); S. W. Straight, Univ. of Michigan Medical School (United States); A. D. Hoppe, South Dakota State Univ. (United States); J. A. Swanson, Univ. of Michigan Medical School (United States); J. P. Ogilvie, Univ. of Michigan (United States)
- 8226 0S **Analysis of human aorta using fluorescence lifetime imaging microscopy (FLIM)** [8226-22]
G. Vieira-Damiani, Univ. Estadual de Campinas (Brazil); J. Adur, Univ. Estadual de Campinas (Brazil) and National Univ. of Entre Rios (Argentina); D. P. Ferro, Univ. Estadual de Campinas (Brazil); R. L. Adam, UNER (Argentina); V. Pelegati, A. Thomáz, C. L. Cesar, K. Metze, Univ. Estadual de Campinas (Brazil)

TECHNOLOGY DEVELOPMENT AND APPLICATIONS I

- 8226 0V **Watching stem cells at work with a flexible multiphoton tomograph (Invited Paper)** [8226-25]
A. Uchugonova, Saarland Univ. (Germany), Univ. of California, San Diego (United States), and AntiCancer Inc. (United States); R. Hoffman, Univ. of California, San Diego (United States) and Anticancer Inc. (United States); M. Weinigel, JenLab GmbH (Germany); K. König, Saarland Univ. (Germany) and JenLab GmbH (Germany)

TECHNOLOGY DEVELOPMENT AND APPLICATIONS II

- 8226 10 **Ray-tracing study on the post-scanner variable beam expansion optics in a two-photon microscopy system** [8226-30]
D.-H. Kim, C. Welle, V. Krauthamer, U.S. Food and Drug Administration (United States)
- 8226 13 **Targeted nanosensor aided three-dimensional pH mapping in tumor spheroids using two-photon microscopy** [8226-33]
A. Ray, Y.-E. K. Lee, R. Elbez, R. Kopelman, Univ. of Michigan (United States)

HARMONIC GENERATION MICROSCOPY I

- 8226 1A **Combined nonlinear laser imaging (two-photon excitation fluorescence, second and third-harmonic generation, and fluorescence lifetime imaging microscopies) in ovarian tumors** [8226-40]
J. Adur, Univ. Estadual de Campinas (Brazil) and National Univ. of Entre Rios (Argentina); V. B. Pelegati, A. A. de Thomaz, F. Bottcher-Luiz, L. A. L. A. Andrade, D. B. Almeida, H. F. Carvalho, C. L. Cesar, Univ. Estadual de Campinas (Brazil)

HARMONIC GENERATION MICROSCOPY II

- 8226 1G **Investigation of the wavelength dependence of SHG from various tissues** [8226-47]
H. J. Askew, S. J. Matcher, The Univ. of Sheffield (United Kingdom)
- 8226 1I **Multiphoton imaging with sub-30 fs Yb fiber laser** [8226-49]
I. Saytashev, B. Nie, Michigan State Univ. (United States); A. Chong, H. Liu, Cornell Univ. (United States); S. Arkhipov, Michigan State Univ. (United States); F. W. Wise, Cornell Univ. (United States); M. Dantus, Michigan State Univ. (United States) and Biophotonic Solutions Inc. (United States)

HYPERSENSITIVE IMAGING WITH CRS

- 8226 1N **High-speed spectral tuning CARS microscopy using AOTF laser** [8226-53]
M. Hashimoto, J. Iwatsuka, H. Niioka, T. Araki, Osaka Univ. (Japan)
- 8226 1O **Ultra-broadband time-resolved coherent anti-Stokes Raman scattering microspectroscopy** [8226-54]
J. Yin, G. Hou, J. Qu, Z. Lin, H. Niu, Shenzhen Univ. (China)

- 8226 1Q **High-resolution high-speed tunable grating filter for stimulated Raman spectral imaging** [8226-56]
W. Umemura, Osaka Univ. (Japan); Y. Ozeki, Osaka Univ. (Japan) and Japan Science and Technology Agency (Japan); K. Fujita, K. Sumimura, Osaka Univ. (Japan); N. Nishizawa, Nagoya Univ. (Japan); K. Itoh, Osaka Univ. (Japan)

APPLICATIONS OF CRS MICROSCOPY

- 8226 1V **Coherent Raman scattering microscopy for label-free imaging of live amphioxus** [8226-61]
Z. Yu, T. Chen, X. Zhang, J. Shen, Peking Univ. (China); J. Chen, Nanjing Univ. (China); Y. Huang, Peking Univ. (China)
- 8226 1W **Neuronal cell growth on polymeric scaffolds studied by CARS microscopy** [8226-62]
A. Enejder, H. Fink, Chalmers Univ. of Technology (Sweden); H.-G. Kuhn, Univ. of Gothenburg (Sweden)
- 8226 20 **Towards a tunable fiber source for coherent Raman imaging** [8226-148]
S. Lefrancois, Cornell Univ. (United States); D. Fu, G. Holtom, Harvard Univ. (United States); L. Kong, Cornell Univ. (United States); W. Wadsworth, Univ. of Bath (United Kingdom); P. Schneider, R. Herda, A. Zach, TOPTICA Photonics AG (Germany); X. S. Xie, Harvard Univ. (United States); F. W. Wise, Cornell Univ. (United States)

CRS FOR MEDICAL DIAGNOSTICS

- 8226 23 **Clinical multiphoton and CARS microscopy** [8226-68]
H. G. Breunig, M. Weinigel, JenLab GmbH (Germany); M. E. Darvin, J. Lademann, Charité Univ. Berlin (Germany); K. König, JenLab GmbH (Germany) and Saarland Univ. (Germany)
- 8226 24 **In vivo monitoring specialized hepatocyte-like cells in *Drosophila* by coherent anti-Stokes Raman scattering (CARS) and two-photon excitation fluorescence (TPE-F) microscopy** [8226-69]
C.-H. Chien, National Yang-Ming Univ. (Taiwan) and Academia Sinica (Taiwan); W.-W. Chen, Academia Sinica (Taiwan); J.-T. Wu, National Taiwan Univ. (Taiwan) and National Taiwan Univ. Hospital (Taiwan); T.-C. Chang, National Yang-Ming Univ. (Taiwan) and Academia Sinica (Taiwan)
- 8226 25 **An integrated coherent anti-Stokes Raman scattering and multiphoton imaging technique for liver disease diagnosis** [8226-70]
J. Lin, F. Lu, W. Zheng, National Univ. of Singapore (Singapore); H. Yu, Yong Loo Lin School of Medicine, National Univ. of Singapore (Singapore) and Institute of Bioengineering and Nanotechnology (Singapore); C. Sheppard, Z. Huang, National Univ. of Singapore (Singapore)

FIBER LASER TECHNOLOGY FOR CRS

- 8226 28 **Fiber delivered two-color picosecond source for coherent Raman scattering imaging (Invited Paper)** [8226-73]
K. Wang, C. Xu, Cornell Univ. (United States)

- 8226 29 **A novel multimodal CARS miniaturized microscope** [8226-74]
B. Smith, M. Naji, S. Murugkar, Univ. of Ottawa (Canada); C. Brideau, P. Stys, Hotchkiss Brain Institute, Univ. of Calgary (Canada); H. Anis, Univ. of Ottawa (Canada)

ADVANCED CRS MICROSCOPY INSTRUMENTATION

- 8226 2B **Computational optimization of phase shaped CARS** [8226-76]
A. C. W. van Rhijn, A. Jafarpour, J. L. Herek, H. L. Offerhaus, Univ. Twente (Netherlands)

POSTER SESSION

- 8226 2I **In vivo multiphoton imaging of the cornea: polarization-resolved second harmonic generation from stromal collagen (Best Paper Award)** [8226-46]
G. Latour, I. Gusachenko, Lab. for Optics and Biosciences, CNRS, Ecole Polytechnique (France); L. Kowalczyk, Lab. for Applied Optics, CNRS, ENSTA ParisTech, Ecole Polytechnique (France); I. Lamarre, M.-C. Schanne-Klein, Lab. for Optics and Biosciences, CNRS, Ecole Polytechnique (France)
- 8226 2J **Studies on wide-field-of-view multiphoton imaging using the flexible clinical multiphoton tomograph MPTflex** [8226-88]
M. Weinigel, H. G. Breunig, P. Fischer, M. Kellner-Höfer, R. Bückle, JenLab GmbH (Germany); K. König, JenLab GmbH (Germany) and Saarland Univ. (Germany)
- 8226 2M **Recommendations for the design and the installation of large laser scanning microscopy systems** [8226-91]
P. J. Helm, Univ. of Oslo (Norway)
- 8226 2O **Comparison of calcium imaging in dorsal root ganglion neurons by using laser scanning confocal and two-photon microscopy** [8226-93]
Y. Huang, H. Yang, J. Chen, X. Shen, L. Zheng, Y. Wang, S. Xie, Fujian Normal Univ. (China)
- 8226 2R **Multifocus nonlinear optical microscopy based on SLM** [8226-96]
W. Qin, Clemson Univ. (United States); Y. Shao, Shenzhen Univ. (China); H. Liu, Clemson Univ. (United States); J. Qu, X. Peng, H. Niu, Shenzhen Univ. (China); B. Gao, Clemson Univ. (United States)
- 8226 2S **Two-photon excited fluorescence spectroscopy and imaging of melanin *in vitro* and *in vivo*** [8226-97]
T. B. Krasieva, Beckman Laser Institute and Medical Clinic (United States); F. Liu, Univ. of California, Irvine (United States); C.-H. Sun, Beckman Laser Institute and Medical Clinic (United States); Y. Kong, Xi'an Jiaotong Univ. (China); M. Balu, Beckman Laser Institute and Medical Clinic (United States); F. L. Meyskens, Univ. of California, Irvine (United States); B. J. Tromberg, Beckman Laser Institute and Medical Clinic (United States)
- 8226 2T **Long-distance fluorescence lifetime imaging with stimulated emission and electronic time delay (Best Paper Award)** [8226-98]
P.-Y. Lin, National Yang-Ming Univ. (Taiwan); S.-S. Lee, National Yang-Ming Univ. (Taiwan) and Academia Sinica (Taiwan); C.-S. Chang, Academia Sinica (Taiwan); F.-J. Kao, National Yang-Ming Univ. (Taiwan)

- 8226 2U **Structural heterogeneities of self-assembled peptide nanomaterials** [8226-99]
N. R. Anthony, A. J. Bisignano, A. K. Mehta, D. G. Lynn, K. M. Berland, Emory Univ. (United States)
- 8226 2Y **Low cost laser system generating 26-fs pulse duration, 30-kW peak power, and tunability from 800 to 1200 nm for multiphoton microscopy** [8226-103]
B. Resan, F. Brunner, A. Rohrbacher, H. Ammann, K. J. Weingarten, Time-Bandwidth Products AG (Switzerland)
- 8226 33 **Random access multiphoton (RAMP) microscopy for investigation of cerebral blood flow regulation mechanisms** [8226-108]
D. J. Christensen, The Institute of Optics (United States) and Univ. of Rochester Medical Ctr. (United States); M. Nedergaard, Univ. of Rochester Medical Ctr. (United States)
- 8226 37 **Three-photon fluorescence imaging of melanin with a dual-wedge confocal scanning system** [8226-112]
Y. Mega, J. Kerimo, J. Robinson, A. Vakili, The Bernard M. Gordon Ctr. for Subsurface Sensing and Imaging Systems, Northeastern Univ. (United States); N. Johnson, Northeastern Univ. (United States) and Univ. of Iowa (United States); C. DiMarzio, The Bernard M. Gordon Ctr. for Subsurface Sensing and Imaging Systems, Northeastern Univ. (United States)
- 8226 3A **Automated control of optical polarization for nonlinear microscopy** [8226-116]
C. Brideau, P. K. Stys, Univ. of Calgary (Canada)
- 8226 3C **Probing live samples in second-harmonic generation microscopy using specific markers and fluorescent proteins (Best Poster Award)** [8226-118]
E. De Meulenaere, Univ. of Leuven (Belgium) and Institute for Nanoscale Physics and Chemistry, Univ. of Leuven (Belgium); R. Paesen, Hasselt Univ. (Belgium); S. Psilodimitrakopoulos, Institut de Ciències Fotòniques (Spain); M. Ameloot, Hasselt Univ. (Belgium); P. Loza-Alvarez, Institut de Ciències Fotòniques (Spain); J. Vanderleyden, Univ. of Leuven (Belgium) and Institute for Nanoscale Physics and Chemistry, Univ. of Leuven (Belgium); K. Clays, Univ. of Leuven (Belgium)
- 8226 3E **Application of second-harmonic generation microscopy for *in-vivo* observation of structural change in human dermal collagen fiber caused by aging and/or UV exposure** [8226-120]
T. Yasui, Univ. of Tokushima (Japan) and Osaka Univ. (Japan); M. Yonetsu, R. Tanaka, S. Fukushima, Osaka Univ. (Japan); T. Yamashita, Y. Ogura, T. Hirao, Shiseido Co. (Japan); T. Araki, Osaka Univ. (Japan)
- 8226 3F **Second harmonic generation microscopy differentiates collagen type I and type III in COPD** [8226-121]
M. Suzuki, The Univ. of British Columbia James Hogg Research Ctr. (Canada) and Hokkaido Univ. (Japan); D. Kayra, W. M. Elliott, J. C. Hogg, T. Abraham, The Univ. of British Columbia James Hogg Research Ctr. (Canada)

- 8226 3G **Second-harmonic generation microscopy used to evaluate the effect of the dimethyl sulfoxide in the cryopreservation process in collagen fibers of differentiated chondrocytes** [8226-122]
M. F. Andreoli-Risso, A. S. S. Duarte, T. B. Ribeiro, P. Bordeaux-Rego, A. Luzo, M. O. Baratti, Univ. Estadual de Campinas (Brazil); J. Adur, Univ. Estadual de Campinas (Brazil) and National Univ. of Entre Rios (Argentina); A. A. de Thomaz, V. B. Pelegati, Univ. Estadual de Campinas (Brazil); H. F. Carvalho, National Univ. of Entre Rios (Argentina); C. L. Cesar, P. Kharmadayan, F. F. Costa, S. T. Olalla-Saad, Univ. Estadual de Campinas (Brazil)
- 8226 3J **Nonlinear optics for the study of human scar tissue** [8226-125]
D. P. Ferro, G. Vieira-Damiani, R. L. Adam, C. L. Cesar, K. Metze, Univ. Estadual de Campinas (Brazil)
- 8226 3N **Use of the second harmonic generation microscopy to evaluate chondrogenic differentiation of mesenchymal stem cells for cartilage repair** [8226-129]
P. Bordeaux-Rego, M. O. Baratti, A. S. S. Duarte, T. B. Ribeiro, M. F. Andreoli-Risso, B. Vidal, J. B. Miranda, Univ. Estadual de Campinas (Brazil); J. Adur, Univ. Estadual de Campinas (Brazil) and National Univ. of Entre Rios (Argentina); A. A. de Thomaz, V. B. Pelegati, F. F. Costa, H. F. Carvalho, C. L. Cesar, A. Luzo, S. T. Olalla Saad, Univ. Estadual de Campinas (Brazil)
- 8226 3O **In-vivo multiphoton microscopy associated to 3D image processing for human skin characterization** [8226-130]
T. Baldeweck, L'Oréal Recherche et Innovation (France); E. Tancrede, L'Oréal Recherche et Innovation (France) and Ctr. De Recherche Bioclinique, Hôpital St. Louis (France); P. Dokladal, S. Koudoro, V. Morard, F. Meyer, E. Decencièrre, MINES ParisTech (France); A.-M. Pena, L'Oréal Recherche et Innovation (France)
- 8226 3P **Quantitative second-harmonic generation imaging to detect osteogenesis imperfecta in human skin samples** [8226-131]
J. Adur, Univ. Estadual de Campinas (Brazil) and National Univ. of Entre Rios (Argentina); A. E. Ferreira, L. D'Souza-Li, V. B. Pelegati, A. A. de Thomaz, D. B. Almeida, M. O. Baratti, H. F. Carvalho, C. L. Cesar, Univ. Estadual de Campinas (Brazil)
- 8226 3R **A study on the spectral dependence of collagen tissues** [8226-133]
M. Shen, The Univ. of British Columbia (Canada); H. Wang, A. Lee, J. Zhao, H. Zeng, The BC Cancer Research Ctr. and Photomedicine Institute (Canada); S. Tang, The Univ. of British Columbia (Canada)
- 8226 3S **Two-photon imaging and spectroscopy of fresh human colon biopsies** [8226-134]
R. Cicchi, European Lab. for Non-linear Spectroscopy, Univ. of Florence (Italy); A. Sturiale, G. Nesi, F. Tonelli, Univ. of Florence (Italy); F. S. Pavone, European Lab. for Non-linear Spectroscopy, Univ. of Florence (Italy)
- 8226 3T **Characterizing the interactions between prolyl isomerase pin1 and phosphatase inhibitor-2 in living cells with FRET and FCS** [8226-135]
Y. Sun, W.M. Keck Ctr. for Cellular Imaging, Univ. of Virginia (United States); L. Wang, Univ. of Virginia (United States); V. Jyothikumar, W.M. Keck Ctr. for Cellular Imaging, Univ. of Virginia (United States) D. L. Brautigan, Univ. of Virginia (United States); A. Periasamy, W.M. Keck Ctr. for Cellular Imaging, Univ. of Virginia (United States)

- 8226 42 **The use of two-photon microscopy to study the biological effects of focused ultrasound on the brain** [8226-145]
A. Burgess, E. E. Cho, Sunnybrook Health Sciences Ctr. (Canada); L. Shaffaf, T. Nhan, Sunnybrook Health Sciences Ctr. (Canada) and Univ. of Toronto (Canada); C. Poon, Sunnybrook Health Sciences Ctr. (Canada); K. Hynynen, Sunnybrook Health Sciences Ctr. (Canada) and Univ. of Toronto (Canada)
- 8226 44 **Monitoring changes in endogenous fluorophores through quantitative FLIM imaging in live cells** [8226-150]
V. Jyothikumar, Y. Sun, A. Periasamy, Univ. of Virginia (United States)

Author Index

Conference Committee

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Warren R. Zipfel, Cornell University (United States)

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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