Front Matter: Volume 9689
Photonic Therapeutics and Diagnostics XII

Bernard Choi
Nikiforos Kollias
Haishan Zeng
Hyun Wook Kang
Brian J. F. Wong
Justus F. Ilgner
Guillermo J. Tearney
Kenton W. Gregory
Laura Marcu
Melissa C. Skala
Paul J. Campagnola
Andreas Mandelis
Editors

13–14 February 2016
San Francisco, California, United States

Sponsored and Published by
SPIE

Volume 9689
## Contents

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ix</td>
<td>Authors</td>
</tr>
<tr>
<td>xiii</td>
<td>Conference Committee</td>
</tr>
</tbody>
</table>

### Part A Phontonics in Dermatology and Plastic Surgery

#### SKIN CANCER I

- 9689 05 Noninvasive skin cancer diagnosis using multimodal optical spectroscopy [9689-4]

#### SKIN CANCER II

- 9689 08 A machine learning method for identifying morphological patterns in reflectance confocal microscopy mosaics of melanocytic skin lesions in-vivo [9689-7]

#### WIDE-FIELD IMAGING II

- 9689 0F Spectral-spatial classification combined with diffusion theory based inverse modeling of hyperspectral images [9689-14]

#### WOUND HEALING

- 9689 0G fluorescence imaging of tryptophan and collagen cross-links to evaluate wound closure ex vivo [9689-15]

#### OCT

- 9689 0M High-resolution label-free vascular imaging using a commercial, clinically approved dermatological OCT scanner (Invited Paper) [9689-21]
- 9689 0N Three-dimensional multifunctional optical coherence tomography for skin imaging [9689-22]
- 9689 0O Towards the use of OCT angiography in clinical dermatology [9689-23]

#### THERAPEUTICS

- 9689 0Q New insights into photodynamic therapy treatment through the use of 3D Monte Carlo radiation transfer modelling [9689-25]
- 9689 0R Laser ablation of basal cell carcinomas guided by confocal microscopy [9689-26]
### OPTICAL MICROSCOPY I

<table>
<thead>
<tr>
<th>9689 0U</th>
<th>Demoscopy-guided reflectance confocal microscopy of skin using high-NA objective lens with integrated wide-field color camera [9689-29]</th>
</tr>
</thead>
<tbody>
<tr>
<td>9689 0W</td>
<td>Investigation of the effect of hydration on dermal collagen in ex vivo human skin tissue using second harmonic generation microscopy [9689-31]</td>
</tr>
</tbody>
</table>

### OPTICAL MICROSCOPY II

| 9689 0Z | An unsupervised machine learning method for delineating stratum corneum in reflectance confocal microscopy stacks of human skin in vivo [9689-34] |

### FLUORESCENCE AND RAMAN SPECTROSCOPY

| 9689 12 | Measurement of diffusion of fluorescent compounds and autofluorescence in skin in vivo using a confocal instrument [9689-37] |

### POSTER SESSION

| 9689 15 | Metal-clad waveguide characterization for contact-based light transmission into tissue [9689-40] |
| 9689 16 | Remote optical configuration of pigmented lesion detection and diagnosis of bone fractures [9689-41] |
| 9689 19 | UV photostability of insect repellents evaluated through Raman spectroscopy [9689-44] |

### Part B  Therapeutics and Diagnostics in Urology

#### ADVANCED TECHNOLOGY IN UROLOGY

| 9689 1A | Fluorescence spectroscopy incorporating a ratiometric approach for the diagnosis and classification of urothelial carcinoma [9689-45] |
| 9689 1B | Cavitation bubble dynamics during thulium fiber laser lithotripsy [9689-46] |

#### PHOTOTHERAPEUTICS

| 9689 1E | Study of cavitation bubble dynamics during Ho:YAG laser lithotripsy by high-speed camera [9689-49] |
| 9689 1G | Thulium fiber laser lithotripsy using small spherical distal fiber tips [9689-51] |
High efficiency for prostate biopsy qualification with full-field OCT after training [9689-54]

Proximal fiber tip damage during Holmium:YAG and thulium fiber laser ablation of kidney stones [9689-62]

Laser treatment of female stress urinary incontinence: optical, thermal, and tissue damage simulations [9689-63]

Diffusing, side-firing, and radial delivery laser balloon catheters for creating subsurface thermal lesions in tissue [9689-64]

Monitoring longitudinal changes in irradiated head and neck cancer xenografts using diffuse reflectance spectroscopy [9689-68]

Progress in reflectance confocal microscopy for imaging oral tissues in vivo [9689-69]

Swept-source anatomic optical coherence elastography of porcine trachea [9689-76]

Measurement of ciliary beat frequency using ultra-high resolution optical coherence tomography [9689-79]

Biochemical and molecular characterization of thyroid tissue by micro-Raman spectroscopy and gene expression analysis [9689-83]

Simultaneous fingerprint and high-wavenumber fiber-optic Raman endoscopy for in vivo diagnosis of laryngeal cancer [9689-84]
Signal and response properties indicate an optoacoustic effect underlying the intra-cochlear laser-optical stimulation [9689-89]

Three-dimensional imaging of intracochlear tissue by scanning laser optical tomography (SLOT) [9689-90]

Combination therapy using antioxidants and low level laser therapy (LLLT) on noise induced hearing loss (NIHL) [9689-91]

Primary investigations on the potential of a novel diode pumped Er:YAG laser system for middle ear surgery [9689-177]

Brillouin spectroscopy of clotting dynamics in a model system [9689-100]

Evaluation of combined near-IR spectroscopic (NIRS)-IVUS imaging as a means to detect lipid-rich plaque burden in human coronary autopsy specimens [9689-102]

OptoDyCE: Automated system for high-throughput all-optical dynamic cardiac electrophysiology [9689-113]

OCT imaging of myocardium extending to pulmonary vein [9689-117]

Influence of distance and incident angle on light intensities in intravascular optical coherence tomography pullback runs [9689-118]

Light intensity matching between different intravascular optical coherence tomography systems [9689-120]

Characterization of atherosclerotic plaques by cross-polarization optical coherence tomography [9689-129]
NEW DIAGNOSTIC TECHNIQUES

9689 3H  A pilot study using laser-based technique for non-invasive diagnostics of hypertensive conditions in mice [9689-123]

9689 3J  Non-contact measurement of carotid arterial stiffness by two-point heart-pulse laser detection [9689-125]

Part E  Diagnostic and Treatment of Diseases in the Breast and Reproductive System II

GYNECOLOGY

9689 3P  Three-photon imaging of ovarian cancer (Invited Paper) [9689-131]

9689 3Q  Improved selection of cortical ovarian strips for autotransplantation of ovarian tissue using full-field optical coherence tomography (FFOCT) [9689-132]

9689 3R  Functional optical coherence tomography for high-resolution mapping of cilia beat frequency in the mouse oviduct in vivo [9689-133]

BREAST CANCER

9689 3Z  Redox subpopulations and the risk of cancer progression: a new method for characterizing redox heterogeneity [9689-145]

9689 41  Using a reflectance-based correction on Cherenkov images to strengthen correlation with radiation surface dose in an anthropomorphic breast phantom [9689-147]

9689 42  Diffuse optical tomography with structured-light patterns to quantify breast density [9689-148]

9689 43  Photoacoustic spectroscopy based investigatory approach to discriminate breast cancer from normal: a pilot study [9689-149]

POSTER SESSION

9689 44  Design of an everting balloon to deploy a microendoscope to the fallopian tubes [9689-134]

9689 45  Wide-field lifetime-based FRETimaging for the assessment of early functional distribution of transferrin-based delivery in breast tumor-bearing small animals [9689-143]

9689 46  Large area 3-D optical coherence tomography imaging of lumpectomy specimens for radiation treatment planning [9689-151]
Cervical collagen imaging for determining preterm labor risks using a colposcope with full Mueller matrix capability [9689-152]

Photodynamic therapy of Cervical Intraepithelial Neoplasia (CIN) high grade [9689-153]

GNR@mSiO2-TDM1 conjugates as multimodal platform for breast cancer therapy as well as enhanced photoacoustic agent [9689-156]

Morphologic 3D scanning of fallopian tubes to assist ovarian cancer diagnosis [9689-159]

Spectroscopic imaging system for high-throughput viability assessment of ovarian spheroids or microdissected tumor tissues (MDTs) in a microfluidic chip [9689-160]

Part F Optics in Bone Surgery and Diagnostics

MUSCULOSKELETAL IMAGING AND DIAGNOSTICS I

Study of photoacoustic measurement of bone health based on clinically relevant models (Invited Paper) [9689-164]

Determining early markers of disease using Raman spectroscopy in a rat combat-trauma model of heterotopic ossification [9689-162]

Photoacoustic imaging of inflammatory arthritis in human joints [9689-163]

Optical diagnostics of osteoblast cells and osteogenic drug screening [9689-166]

Fourth near-infrared optical window for assessment of bone and other tissues [9689-167]

A portable cross-shape near-infrared spectroscopic detector for bone marrow lesions diagnosis [9689-165]

BONE SURGERY AND DIAGNOSTICS

Spatially offset raman spectroscopy for non-invasive assessment of fracture healing (Invited Paper) [9689-173]

In-situ photopolymerized and monitored implants: successful application to an intervertebral disc replacement [9689-168]

POSTER SESSION

Reliability analysis of instrument design of noninvasive bone marrow disease detector [9689-172]
Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Ahmad, Shakil, 3H
Ahmed, Asif, 3H
Alessi-Fox, Christi A., 08, 0Z
Alfano, Robert R., 4J
Ambrose, Catherine, 4M
Ambrosi, Christina M., 36
Amirsolaimani, Babak, 3P
Anand, Suresh, 1A
Anderson, R. Rox, 0G
Andrade, J., 2H
Andraezi, Jacqueline Marie, 1W, 41
Antonopoulos, G. C., 2H
Arbusini, E., 3J
Ayadi, J., 3J
Badger, Christopher, 26
Bagnato, Vanderlei Salvador, 48
Baran, Uku, 0Q
Bamard, Nicola, 46
Barroso, Margarida, 45
Barton, Jennifer Kehlet, 3P, 44
Baumhoff, Peter, 2G
Behringer, Richard R., 3R
Beideman, Yevgeny, 16
Belotto, Renata, 48
Benboujja, Fouzi, 4D
Benedetti, M., 3J
Beuvon, F., 1J
Bi, Xiaohong, 4M
Bien, Harold, 36
Bishlitz, Yael, 41
Bjorgan, Asgeir, 0F
Black, John, 44
Borlo, Viviane Gadret, 19
Boss, Tjalling, 3Q
Boudoux, Caroline, 4D
Bourban, Pierre-Etienne, 4N
Bozkurt, Alican, 0Z
Brandao, Lenine G., 2A
Brooks, Dana H., 08, 0Z
Brown, C. Tom A., 0Q
Brown, N. J., 0M
Bu, Ruofei, 26
Butt, Jesse C., 3R
Bustamante-Lopez, Sandra C., 2T
Buttenschoen, K. K., 12
Byers, R. A., 0M
Campbell, C. Louis, 0Q
Canevari, Renata A., 2A
Cao, Fei, 4A
Cao, Meng, 4F
Carbinatto, Femanda M., 4B
Carini, Marco, 1A
Cemea, Claudio R., 2A
Chandra, Subhash, 43
Chang, Chun-Hung, 1R, 1S
Chang, So-Young, 2I
Chen, Chih-Shan Jason, 0R
Chen, Jason J., 26
Chen, Jeon-hor, 42
Chen, Yu, 3A
Chen, Zhongping, 26
Cheng, Qian, 4F
Chermomordik, Viktor, 47
Chininos, Jeffrey, 15
Cho, Jaedu, 42
Choi, Woo June, 0Q
Chue-Sang, Joseph, 47
Chung, Phil-Sang, 2I
Cicchi, Riccardo, 1A
Ciurma, Katherine E., 4G
Consoli, A., 3J
Cordova, Miguel, 0R, 1X
Coughlan, Carolyn A., 26
Crane, Nicole J., 4G
Crisci, Alfonso, 1A
da Silva, Eduardo Venerando, 48
Dalimer, E., 1J
Daly, D., 12
Datta, Anirbit, 43
Davis, Thomas A, 4G
De Montigny, Etienne, 4D
Delongchamps, N. Barry, 1J
Deschênes, Andréanne, 4D
Devinski, Dennis, 1E
Dickenschteins, David L., 0U
Dickfeld, Timm, 3A
Dijkstra, Jouke, 3B, 3D, 3Q
Ding, Hao, 4M
Duc, A., 3J
Dudenchikova, Varvara V., 3F
Dy, Jennifer G., 0B, 0Z
Eggermont, Jenifer, 3B, 3D, 3Q
Entcheva, Emilia, 36
Farnelli, Bill, 0G
Favalli, V., 3J
Feldstein, Felix I., 3F
Feng, Ting, 4F
Feng, Xu, 05
Fernandes, Adjaci Uchôa, 19
Forsberg, Jonathan A., 4G
Conference Committee

Symposium Chairs

James G. Fujimoto, Massachusetts Institute of Technology (United States)
R. Rox Anderson, Wellman Center for Photomedicine, Massachusetts General Hospital (United States) and Harvard School of Medicine (United States)

Program Track Chair

Brian Jet-Fei Wong, Beckman Laser Institute and Medical Clinic (United States)

Part A  Photonics in Dermatology and Plastic Surgery

Conference Chairs

Bernard Choi, Beckman Laser Institute and Medical Clinic (United States)
Nikiforos Kollias, Consultant (United States)
Haishan Zeng, The BC Cancer Agency Research Center (Canada)

Conference Program Committee

Anthony J. Durkin, Beckman Laser Institute and Medical Clinic (United States)
Conor L. Evans, Wellman Center for Photomedicine (United States)
Kristen Marie Kelly M.D., University of California, Irvine School of Medicine (United States)
Milind Rajadhyaksha, Memorial Sloan-Kettering Cancer Center (United States)
Jessica C. Ramella-Roman, The Catholic University of America (United States)
Lise Lyngsnes Randeborg, Norwegian University of Science and Technology (Norway)
Session Chairs

Skin Cancer I
**Milind Rajadhyaksha**, Memorial Sloan-Kettering Cancer Center
(United States)

Skin Cancer II
**Kristen M. Kelly M.D.**, Beckman Laser Institute and Medical Clinic
(United States)

Clinical Perspective
**Anthony J. Durkin**, Beckman Laser Institute and Medical Clinic
(United States)

Wide-Field Imaging I
**Anthony J. Durkin**, Beckman Laser Institute and Medical Clinic
(United States)

Wide-Field Imaging II
**Jessica C. Ramella-Roman**, Florida International University
(United States)

Wound Healing
**Jessica C. Ramella-Roman**, Florida International University
(United States)

Optical Clearing
**Haishan Zeng**, BC Cancer Research Center (Canada)

OCT
**Haishan Zeng**, BC Cancer Research Center (Canada)

Therapeutics
**Bernard Choi**, Beckman Laser Institute and Medical Clinic
(United States)

Optical Microscopy I
**Lise L. Randeberg**, Norwegian University of Science and Technology
(Norway)

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

Fluorescence and Raman Spectroscopy
**Conor L. Evans**, Wellman Center for Photomedicine (United States)
Part B    Therapeutics and Diagnostics in Urology

Conference Chair

Hyun Wook Kang, Pukyong National University (Korea, Republic of)

Conference Program Committee

Geoffrey N. Box M.D., The Ohio State University (United States)
Kin Foong Chan, Dermira, Inc. (United States)
Nathaniel M. Fried, The University of North Carolina at Charlotte (United States)
Babak Shadgan M.D., The University of British Columbia (Canada)
Ronald Sroka, Laser-Forschungslabor (Germany)
Joel M. Teichman M.D., St. Paul's Hospital (Canada)
Matthias Trottmann, Universität München (Germany)
Rudolf M. Verdaasdonk, Vrije University Medical Center (Netherlands)

Session Chairs

1  Advanced Technology in Urology
Nathaniel M. Fried, The University of North Carolina at Charlotte (United States)
Kin Foong Chan, Dermira, Inc. (United States)

2  Phototherapeutics
Kin Foong Chan, BioPharmX, Inc. (United States)

3  Tissue imaging
Ronald Sroka, Laser-Forschungslabor (Germany)
Kin Foong Chan, Dermira, Inc. (United States)

4  Tissue Diagnostics
Ronald Sroka, Laser-Forschungslabor (Germany)
Part C  Optical Imaging, Therapeutics, and Advanced Technology in Head and Neck Surgery and Otolaryngology

Conference Chairs

Brian J. F. Wong M.D., Beckman Laser Institute and Medical Clinic (United States)
Justus F. Ilgner M.D., University Hospital Aachen (Germany)

Conference Program Committee

Waseem K. Jerjes, University College London (United Kingdom)
Joseph C. Jing, Beckman Laser Institute and Medical Clinic (United States)
Milind Rajadhyaksha, Memorial Sloan-Kettering Cancer Center (United States)
Chung-Ku Rhee M.D., Dankook University Hospital (Korea, Republic of)
Jennifer E. Rosen, Boston University (United States)
Henricus J. C. M. Sterenborg, Erasmus MC (Netherlands)

Session Chairs

1 Clinical and Operative Head and Neck Cancer Imaging
   Brian J. F. Wong, Beckman Laser Institute and Medical Clinic (United States)
   Justus F. Ilgner M.D., Uniklinik RWTH Aachen (Germany)

2 OCT Applications in the Head, Neck, and Upper Airway I
   Joseph C. Jing, Beckman Laser Institute and Medical Clinic (United States)

3 OCT Applications in the Head, Neck, and Upper Airway II
   Justus F. Ilgner M.D., Uniklinik RWTH Aachen (Germany)
   Joseph C. Jing, Beckman Laser Institute and Medical Clinic (United States)

4 Endocrine Imaging and Spectroscopy
   Milind Rajadhyaksha, Memorial Sloan-Kettering Cancer Center (United States)

5 Inner and Middle Ear Imaging and Physiology
   Chung-Ku Rhee M.D., Dankook University Hospital (Korea, Republic of)
   Justus F. Ilgner M.D., Uniklinik RWTH Aachen (Germany)
Part D       Diagnostic and Therapeutic Applications of Light in Cardiology

Conference Chairs

Guillermo J. Teamey M.D., Wellman Center for Photomedicine (United States)

Kenton W. Gregory M.D., Oregon Medical Laser Center (United States)

Laura Marcu, University of California, Davis (United States)

Conference Program Committee

Gijs van Soest, Erasmus MC (Netherlands)

Carlo Di Mario, University College London (United Kingdom)

Stanislav Y. Emelianov, The University of Texas at Austin (United States)

Session Chairs

1  Advanced OCT
   Gijs van Soest, Erasmus MC (Netherlands)

2  Blood
   Seemantini K. Nadkami, Harvard Medical School (United States)

3  Multimodality Imaging
   Hongki Yoo, Hanyang University (Korea, Republic of)

4  Photacoustics and Spectroscopy
   Laura Marcu, University of California, Davis (United States)

5  Myocardium
   Kenton W. Gregory M.D., Oregon Medical Laser Center (United States)

6  Intravascular OCT
   Guillermo J. Teamey, Wellman Center for Photomedicine (United States)

7  New Diagnostic Techniques
   Adrien E. Desjardins, University College London (United Kingdom)
Part E  Diagnosis and Treatment of Diseases in the Breast and Reproductive System II

Conference Chairs
Melissa C. Skala, Vanderbilt University (United States)
Paul J. Campagnola, University of Wisconsin-Madison (United States)

Conference Program Committee
Ji-Xin Cheng, Purdue University (United States)
Darren M. Roblyer, Boston University (United States)
Anita Mahadevan-Jansen, Vanderbilt University (United States)
Bruce J. Tromberg, Beckman Laser Institute and Medical Clinic (United States)

Session Chairs
1  Gynecology
   Anita Mahadevan-Jansen, Vanderbilt University (United States)
   Melissa C. Skala, Vanderbilt University (United States)

2  Tumor Margin Assessment
   Paul J. Campagnola, University of Wisconsin-Madison (United States)

3  Optical Coherence Tomography and Fluorescence Imaging
   Melissa C. Skala, Vanderbilt University (United States)

4  Breast Cancer
   Darren M. Roblyer, Boston University (United States)

Part F  Optics in Bone Surgery and Diagnostics

Conference Chair
Andreas Mandelis, University of Toronto (Canada)

Conference Co-chair
Michael D. Morris, University of Michigan (emeritus) (United States)

Conference Program Committee
Robert R. Alfano, The City College of New York (United States)
Bennett T. Amaechi, The University of Texas Health Science Center at San Antonio (United States)
Peter Fratzl, Max-Planck-Institut für Kolloid- und Grenzflächenforschung (Germany)
Huabei Jiang, University of Florida (United States)
Stephen J. Matcher, The University of Sheffield (United Kingdom)
Eleftherios P. Paschalis, Ludwig Boltzmann Institut (Austria)
Rahul Tandon D.D.S., Loma Linda University (United States)
Xueding Wang, University of Michigan Medical School (United States)
Victor X. D. Yang, Ryerson University (Canada)

Session Chairs
1  Musculoskeletal Imaging and Diagnostics I
   Andreas Mandelis, University of Toronto (Canada)
2  Bone Surgery and Diagnostics
   Michael D. Morris, University of Michigan (United States)
3  Musculoskeletal Imaging and Diagnostics II
   Xueding Wang, University of Michigan (United States)