Optical Diagnostics and Sensing XVI: Toward Point-of-Care Diagnostics

Gerard L. Coté
Editor

15–16 February 2016
San Francisco, California, United States

Sponsored and Published by
SPIE
The papers in this volume were part of the technical conference cited on the cover and title
page. Papers were selected and subject to review by the editors and conference program
committee. Some conference presentations may not be available for publication. Additional
papers and presentation recordings may be available online in the SPIE Digital Library at
SPIEDigitalLibrary.org.

The papers reflect the work and thoughts of the authors and are published herein as submitted.
The publisher is not responsible for the validity of the information or for any outcomes resulting from
reliance thereon.

Please use the following format to cite material from these proceedings:
Author(s), "Title of Paper," in Optical Diagnostics and Sensing XVI: Toward Point-of-Care
Six-digit Article CID Number.

ISSN: 1605-7422
ISSN: 2410-9045 (electronic)
ISBN: 9781628419498

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

Copyright © 2016, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of
specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by
SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this
volume is $18.00 per article (or portion thereof), which should be paid directly to the Copyright
Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made
electronically through CCC Online at copyright.com. Other copying for republication, resale,
advertising or promotion, or any form of systematic or multiple reproduction of any material in this
book is prohibited except with permission in writing from the publisher. The CCC fee code is
1605-7422/16/$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE. DIGITAL LIBRARY
SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model. A unique citation
identifier (CID) number is assigned to each article at the time of publication. Utilization of CIDs
allows articles to be fully citable as soon as they are published online, and connects the same
identifier to all online and print versions of the publication. SPIE uses a six-digit CID article
numbering system structured as follows:
• The first four digits correspond to the SPIE volume number.
• The last two digits indicate publication order within the volume using a Base 36 numbering
system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04,
05, 06, 07, 08, 09, OA, OB ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each
page of the manuscript.
SESSION 1  POINT-OF-CARE DIAGNOSTICS I

9715 03 The use of reverse iontophoresis based surface plasmon resonance for the development of a noninvasive real time transdermal biomarker sensor [9715-2]

9715 05 Fluorescent detection of C-reactive protein using polyamide beads [9715-4]

SESSION 2  POINT-OF-CARE DIAGNOSTICS II: CELL PHONE BASED SYSTEMS

9715 07 Diffractive interference optical analyzer (DIOPTER) [9715-6]

9715 08 Smartphone based point-of-care detector of urine albumin [9715-7]

9715 09 All-in-one detector of circulating mRNA based on a smartphone [9715-8]

9715 0A Low-cost computing and network communication for a point-of-care device to perform a 3-part leukocyte differential [9715-9]

SESSION 3  POINT-OF-CARE DIAGNOSTICS III: RAMAN SPECTROSCOPY APPROACHES

9715 0B Surface enhanced Raman spectroscopy as a point-of-care diagnostic for infection in wound effluent [9715-10]

9715 0C Raman spectroscopy and the spectral correlation index for predicting wound healing outcome: towards in vivo application [9715-11]

9715 0D Development of an optofluidic SERS-based biomedical sensor [9715-12]

9715 0E Effectiveness of surface enhanced Raman spectroscopy of tear fluid with soft substrate for point-of-care therapeutic drug monitoring [9715-13]

SESSION 4  OPTICAL DIAGNOSTICS FOR DEVELOPING COUNTRIES

9715 0F Investigation of surface enhanced Raman spectroscopy for hemozoin detection in malaria diagnosis [9715-14]

9715 0H Whole-animal imaging of bacterial infection using endoscopic excitation of β-lactamase (BlaC)-specific fluorogenic probe [9715-16]
<table>
<thead>
<tr>
<th>SESSION 5</th>
<th>OPTICAL MONITORING OF BLOOD PERFUSION AND FLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>9715 0K</td>
<td>Feasibility of endoscopic laser speckle imaging modality in the evaluation of auditory disorder: study in bone-tissue phantom [9715-19]</td>
</tr>
<tr>
<td>9715 0L</td>
<td>A compact instrument to measure perfusion of vasculature in transplanted maxillofacial free flaps [9715-20]</td>
</tr>
<tr>
<td>9715 0M</td>
<td>Assessment of sacrococcygeal pressure ulcers using diffuse correlation spectroscopy [9715-21]</td>
</tr>
<tr>
<td>9715 0O</td>
<td>Assessment of multi-wavelength pulse photometry for non-invasive dose estimation of circulating drugs and nanoparticles [9715-23]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SESSION 6</th>
<th>OPTICAL BLOOD OXYGENATION MEASUREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>9715 0P</td>
<td>A wearable optical device for continuous monitoring during neoadjuvant chemotherapy infusions [9715-24]</td>
</tr>
<tr>
<td>9715 0Q</td>
<td>Polarized hyperspectral imaging system for in vivo detection of vulvar lichen sclerosis [9715-25]</td>
</tr>
<tr>
<td>9715 0S</td>
<td>Novel multi wavelength sensor concept to measure carboxy- and methemoglobin concentration non-invasively [9715-27]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SESSION 7</th>
<th>OPTICAL GLUCOSE MONITORING</th>
</tr>
</thead>
<tbody>
<tr>
<td>9715 0T</td>
<td>Characterization of a multi-module tunable EC-QCL system for mid-infrared biofluid spectroscopy for hospital use and personalized diabetes technology [9715-28]</td>
</tr>
<tr>
<td>9715 0U</td>
<td>A closed-loop dual-modulation multi-spectral polarimeter for glucose monitoring [9715-29]</td>
</tr>
<tr>
<td>9715 0V</td>
<td>Glucose sensing through Fano resonances in mesoscale silica core-gold shell particles arrays [9715-30]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SESSION 8</th>
<th>OPTICAL IMAGING FOR CANCER</th>
</tr>
</thead>
<tbody>
<tr>
<td>9715 0Y</td>
<td>Enhancing contrast and quantitation by spatial frequency domain fluorescence molecular imaging [9715-33]</td>
</tr>
<tr>
<td>9715 0Z</td>
<td>In vivo measurement of non-keratinized squamous epithelium using a spectroscopic microendoscope with multiple source-detector separations [9715-34]</td>
</tr>
<tr>
<td>9715 10</td>
<td>LED-based near infrared sensor for cancer diagnostics [9715-36]</td>
</tr>
<tr>
<td>9715 12</td>
<td>Long-range non-contact imaging photoplethysmography: cardiac pulse wave sensing at a distance [9715-39]</td>
</tr>
<tr>
<td>9715 14</td>
<td>Low-dose intrathecal fluorescein for diagnosis of cerebrospinal fluid rhinorrhea using the scanning fiber endoscope in the human nasal cavities [9715-41]</td>
</tr>
<tr>
<td>9715 15</td>
<td>Non-contact measurement of pulse wave velocity using RGB cameras [9715-42]</td>
</tr>
<tr>
<td>9715 17</td>
<td>Performance testing of a mid-infrared spectroscopic system for clinical chemistry applications utilising an ultra-broadband tunable EC-QCL radiation source [9715-44]</td>
</tr>
<tr>
<td>9715 18</td>
<td>Single chip AWG-based Raman spectroscopy for continuous glucose monitoring [9715-45]</td>
</tr>
<tr>
<td>9715 1A</td>
<td>Self-emission glucose monitoring system with single chip guided-mode resonance filters [9715-47]</td>
</tr>
<tr>
<td>9715 1C</td>
<td>Comparison of production methods of a spiral inertial microfluidic cell separation device [9715-49]</td>
</tr>
<tr>
<td>9715 1D</td>
<td>Probing focal cortical dysplasia in formalin fixed samples using tissue optical spectroscopy [9715-50]</td>
</tr>
<tr>
<td>9715 1E</td>
<td>Application of spectroscopic techniques for the analysis of kidney stones: a pilot study [9715-51]</td>
</tr>
<tr>
<td>9715 1F</td>
<td>Blood flow contrast enhancement in optical coherence tomography using microbubbles: a phantom study [9715-52]</td>
</tr>
<tr>
<td>9715 1G</td>
<td>Inter- and intra-individual differences in skin hydration and surface lipids measured with mid-infrared spectroscopy [9715-53]</td>
</tr>
<tr>
<td>9715 1H</td>
<td>A disposable flexible skin patch for clinical optical perfusion monitoring at multiple depths [9715-54]</td>
</tr>
</tbody>
</table>
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.

Adhikari, Pratik, 0O
Ageev, Vladimir, 10
Aitchison, Stewart, 05
Akers, Walter J., 0Y
Alopat, Daisy V., 0A
Anand, Suresh, 1D
Aoki, Yuta, 15
Artyushenko, Viacheslav, 10
Assadi, Homa, 1F
Balogh, Jaroslav, 09
Bankapur, Asef, 1E
Belikova, Valeria, 10
Berger, Adam G., 0C
Blackford, Ethan B., 12
Bogomolov, Andrey, 10
Bowers, Margaret A., 12
Brock, Beate, 0S
Buccoliero, Anna Maria, 1D
C., Santhosh, 1E
Cameron, Brent D., 03
Chang, Shufang, 0Q
Chawla, Arun, 1E
Chen, Keren, 0F
Chen, Lu, 05
Cheng, Yunfeng, 0H
Christian, James F., 0L, 1H
Cicchi, Riccardo, 1D
Cirillo, Jeffrey D., 0H
Cmlet, Vratislav, 0B, 09
Conti, Valerio, 1D
Cormier, Timothy, 0P
Côté, Gerard L., 0D, 0U, 1C
Crane, Nicole J., 0B, 0C
Davis, Calvin G., 14
Davis, Greg E., 14
Demidov, Valentin, 1F
Deutz, Nicolaas, 0D
Diaz, David, 0M
DiMaria-Ghalli, Rose Ann, 0M
Douplik, Alexandre, 1F
Eklund, Wakako, 0O
Eisner, Eric A., 0C
Endo, T., 0E
Estepp, Justin R., 12
Ewald, Hartmut, 0S
Ezerskaia, A., 1G
Farhoodfar, Avid, 18
Farkas, Dana L., 0L, 1H
Feekin, Lauren E., 0A
Feinberg, Stephen E., 0L, 1H
Feliksberger, E., 10
Fernandez, Daniel E., 0L, 1H
Fried, Guy W., 0M
Gewiss, Helge, 0S
Ghebremedhin, Meron, 0B
Giordano, Flavio, 1D
Grafen, M., 0T, 17
Greering, Gage J., 0Z
Guerrini, Renzo, 1D
Gumulec, Jaramir, 09
Gupta, Niraj K., 03
Ha, Myungjin, 0K
Hathi, Deep, 0Y
Heise, H. M., 0T, 17
Hoshi, Akira, 15
Hou, Vivian W., 14
Huang, Po-Jung, 0D
Huang, Zhiwei, 0Y
Hudcova, Kristyna, 09
Hutcheson, Joshua A., 0A
Hwang, Yongsoo, 03
Ihrig, D., 0T, 17
Imai, H., 0E
Jagadeesh, Shreesh, 0S
Jang, Seulki, 0K
Jeong, H., 0E
Johnson, Christopher P., 1H
Joyner, Michael J., 1H
Jung, Byungjo, 0K
K. M., Muhammed Shameem, 1E
Kameoka, Jun, 0D
Kamysek, Svend, 0S
Karshafian, Raffi, 1F
Kido, M., 0E
Kirsanov, Dmitry, 10
Klosterman, Samantha L., 12
Kolodziejski, Noah J., 0L, 1H
Koscova, Pavlina, 0B
Kraill, Jens, 0S
Ladasky, John, 18
Lafontant, Alec, 0M
Lee, Sangyeob, 0K
Lee, Seung Yup, 0L, 1H
Lewin, Peter A., 0M
Liu, Peng, 0Q
Liu, Quan, 0F
Liu, Songde, 0Q
Maitland, Kristen C., 0H
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 Chairs

Ammasi Periasamy, University of Virginia (United States)

Daniel L. Farkas, University of Southern California (United States) and Spectral Molecular Imaging, Inc. (United States)

Conference Chair

Gerard L. Coté, Texas A&M University (United States)

Conference Program Committee

Brent D. Cameron, The University of Toledo (United States)

Werner Gellermann, The University of Utah (United States)

Herbert Michael Heise, University of Applied Sciences of South-Westphalia, Iserlohn (Germany)

Jürgen M. Lademann, Charité Universitätsmedizin Berlin (Germany)

Kristen C. Maitland, Texas A&M University (United States)

Michael J. McShane, Texas A&M University (United States)

Kenith E. Meissner, Swansea University (United Kingdom)

Timothy J. Muldoon, University of Arkansas (United States)

Aydogan Ozcan, University of California, Los Angeles (United States)

Babak Shadgan, The University of British Columbia (Canada)

Kexin Xu, Tianjin University (China)

Shaoqun Zeng, Britton Chance Center for Biomedical Photonics (China)

Session Chairs

1  Point-of-Care Diagnostics I

   Brent D. Cameron, The University of Toledo (United States)

2  Point-of-Care Diagnostics II: Cell Phone Based Systems

   Timothy J. Muldoon, University of Arkansas (United States)
3 Point-of-Care Diagnostics III: Raman Spectroscopy Approaches
Katherine E. Cilwa, Naval Medical Research Center (United States)

4 Optical Diagnostics for Developing Countries
Gerard L. Cote, Texas A&M University (United States)

5 Optical Monitoring of Blood Perfusion and Flow
Patrick O’Neal, Louisiana Tech University (United States)

6 Optical Blood Oxygenation Measurements
Darren M. Roblyer, Boston University (United States)

7 Optical Glucose Monitoring
Herbert Michael Heise, University of Applied Sciences of South-Westphalia, Iserlohn (Germany)

8 Optical Imaging for Cancer
Walter J. Akers, Washington University in St. Louis School of Medicine (United States)