

# ***Quantitative Phase Imaging III***

**Gabriel Popescu**  
**YongKeun Park**  
*Editors*

**29–31 January 2017**  
**San Francisco, California, United States**

*Sponsored and Published by*  
SPIE

**Volume 10074**

Proceedings of SPIE, 1605-7422, V. 10074

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Quantitative Phase Imaging III, edited by Gabriel Popescu, YongKeun Park, Proc. of SPIE Vol.  
10074, 1007401 · © 2017 SPIE · CCC code: 1605-7422/17/\$18 · doi: 10.1117/12.2276719

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 [SPIDigitalLibrary.org](http://SPIDigitalLibrary.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 *Quantitative Phase Imaging III*, edited by Gabriel Popescu, YongKeun Park, Proceedings of SPIE Vol. 10074 (SPIE, Bellingham, WA, 2017) Seven-digit Article CID Number.

ISSN: 1605-7422

ISSN: 2410-9045 (electronic)

ISBN: 9781510605893

ISBN: 9781510605909 (electronic)

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](http://SPIE.org)

Copyright © 2017, 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](http://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 1605-7422/17/\$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**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.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 seven-digit CID article numbering system structured as follows:

- The first five 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, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

# Contents

- v *Authors*
- vii *Conference Committee*

---

## **QPI METHODOLOGIES I**

---

- 10074 09 **Sparsity assisted approach for imaging from laser speckle** [10074-8]

---

## **QPI METHODOLOGIES II**

---

- 10074 0E **Sources and propagation of errors in quantitative phase imaging techniques using optical interferometry** [10074-13]
- 10074 0F **Adaptive flow-field measurements using digital holography** [10074-14]
- 10074 0J **A model for quantifying contrast enhancement in Optical Coherence Tomography (OCT)** [10074-50]

---

## **QPI METHODOLOGIES III**

---

- 10074 0Q **Photothermal quantitative phase imaging of living cells with nanoparticles utilizing a cost-efficient setup** [10074-24]

---

## **QPI OF CELLS AND TISSUES I**

---

- 10074 0U **Quantitative assessment of cancer cell morphology and movement using telecentric digital holographic microscopy** [10074-28]
- 10074 0V **Monitoring of live cell cultures during apoptosis by phase imaging and Raman spectroscopy** [10074-29]
- 10074 10 **Micro patterned surfaces: an effective tool for long term digital holographic microscopy cell imaging** [10074-34]

---

## **QPI OF CELLS AND TISSUES II**

---

- 10074 12 **Chemotaxis and migration of cancer cells in three-dimensional environment monitored label-free by quantitative phase digital holographic microscopy** [10074-36]

10074 13 **Digital holographic microscopy overcomes the limitations of in vitro nanomaterial cytotoxicity testing** [10074-37]

---

**QPI CLINICAL APPLICATIONS**

---

10074 17 **Opportunities of QPI in the epigenetic diagnostics and assessment of therapeutic efficacy** [10074-41]

---

**QPI ALGORITHMS AND IMAGE PROCESSING**

---

10074 1D **Reconstruction method for extended depth-of-field limited-angle tomography** [10074-45]

10074 1E **Optical projection tomography via phase retrieval algorithms for hidden three dimensional imaging** [10074-46]

10074 1F **Modeling light propagation through scattering medium via numerical solutions of Maxwell's equations (Invited Paper)** [10074-47]

10074 1G **Shot noise-limited Cramér-Rao bound and algorithmic sensitivity for wavelength shifting interferometry** [10074-48]

10074 1H **A fast Fourier ptychographic microscope method with biomedical application** [10074-49]

---

**POSTER SESSION**

---

10074 1I **Low cost label-free live cell imaging for biological samples** [10074-53]

10074 1J **MTF evaluation of in-line phase contrast imaging system** [10074-54]

10074 1K **Phase retrieval for non-ideal in-line phase contrast x-ray imaging** [10074-55]

10074 1P **Anisotropy imaging using polarization and angular multiplexing** [10074-60]

10074 1R **Optical characterization of tissue-simulating phantoms with microparticles by Digital Image Plane Holography** [10074-62]

10074 1S **Low-cost production and sealing procedure of mechanical parts of a versatile 3D-printed perfusion chamber for digital holographic microscopy of primary neurons in culture** [10074-63]

10074 1T **The study on the parallel processing based time series correlation analysis of RBC membrane flickering in quantitative phase imaging** [10074-64]

## Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five 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.

Ancora, Daniele, 1E  
Anctil, Gabriel, 1S  
Arce-Diego, José L., 1R  
Arévalo-Díaz, Laura, 1R  
Bedrossian, Manuel, 0E  
Bélanger, Erik, 1S  
Belyakov, Vladimir, 17  
Büttner, Lars, 0F  
Castracane, James, 0V  
Chen, Shichao, 1G  
Chung, Byung Min, 0U  
Czarske, Jürgen W., 0F  
de la Zerda, Adam, 0J  
Desta, Habben, 0V  
Di Battista, Diego, 1E  
Duan, Chaijie, 1H  
Fanjul-Vélez, Félix, 1R  
Fregin, Bob, 0F  
Gao, Feng, 1J, 1K  
Gaur, Charu, 09  
Giasafaki, Georgia, 1E  
Greve, Burkhard, 0Q  
Guo, Baikuan, 1K  
Isbach, Michael, 0Q  
Kemper, Björn, 0Q, 10, 12, 13  
Ketelhut, Steffi, 0Q, 12, 13  
Khare, Kedar, 09  
Khmaldze, Alexander, 0V  
König, Jörg, 0F  
Koukourakis, Nektarios, 0F  
Krauze, Wojciech, 1D  
Kuang, Yawei, 1H  
Kujawińska, Małgorzata, 1D  
Kuś, Arkadiusz, 1D  
Kuznetsov, Aleksandr, 17  
Lam, Van, 0U  
Lee, Minsuk, 1T  
Lee, Seungrag, 1T  
Lévesque, Sébastien A., 1S  
Li, Jiao, 1J, 1K  
Liapis, Evangelos, 1E  
Liba, Orly, 0J  
Lilge, Inga, 10  
Lindensmith, Chris, 0E  
Ma, Hui, 1H  
Mahajan, Supriya D., 0V  
Maloney, Maxwell C., 0V  
Marquet, Pierre, 1S  
Metelin, Vladislav, 17  
Mues, Sarah, 10, 13  
Nadeau, Jay, 0E  
Nehmetallah, Georges, 0U  
Nguyen, Thanh C., 0U  
Park, Byungjun, 1T  
Park, Jun Yong, 0V  
Poulin-Girard, Anne-Sophie, 1S  
Psycharakis, Stylianos, 1E  
R. V., Vinu, 09, 1P  
Raub, Christopher, 0U  
Rodríguez-Colmenares, Miguel A., 1R  
Saide, George, 0V  
Schnekenburger, Jürgen, 0Q, 10, 12, 13  
Schönherr, Holger, 10  
Seniya, C., 1I  
Serabyn, Eugene, 0E  
Sfakis, Lauren, 0V  
Shaked, Natan T., 0Q  
Sharikova, Anna, 0V  
Singh, Rakesh Kumar, 09, 1P  
Skrzypek, Ewa, 1D  
Soni, Niraj K., 1P  
SoRelle, Elliott, 0J  
Sun, Xiaoran, 1J  
Towers, C. E., 1I  
Towers, D. P., 1I  
Tseng, Snow H., 1F  
Turko, Nir A., 0Q  
V., Aparna, 1P  
Vasilenko, Irina, 17  
Winebraub, Yonatan, 0J  
Won, Youngjae, 1T  
Yakushina, Tatiana, 17  
Yang, Chih-Yao, 1F  
Zacharakis, Giannis, 1E  
Zacharopoulos, Athanasios, 1E  
Zhang, Limin, 1J, 1K  
Zhao, Huijuan, 1J, 1K  
Zhou, Zhongxing, 1J, 1K  
Zhu, Yizheng, 1G



# 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  
SMI (United States)

## *Conference Chairs*

**Gabriel Popescu**, University of Illinois at Urbana-Champaign  
(United States)

**YongKeun Park**, KAIST (Korea, Republic of)

## *Conference Program Committee*

**George Barbastathis**, Massachusetts Institute of Technology  
(United States)

**Audrey K. Bowden**, Stanford University (United States)

**Pietro Ferraro**, Istituto di Scienze applicata e Sistemi Intelligenti (Italy)

**Björn Kemper**, Westfälische Wilhelms-Universität Münster (Germany)

**Myung K. Kim**, University of South Florida (United States)

**Theo Lasser**, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

**Jerome Mertz**, Boston University (United States)

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

**Demetri Psaltis**, Ecole Polytechnique Fédérale de Lausanne  
(Switzerland)

**Colin James Richard Sheppard**, Istituto Italiano di Tecnologia (Italy)

**Peter T. C. So**, Massachusetts Institute of Technology (United States)

**Laura Waller**, University of California, Berkeley (United States)

**Changhuei Yang**, California Institute of Technology (United States)

## *Session Chairs*

- 1 QPI Methodologies I  
**YongKeun Park**, KAIST (Korea, Republic of)

- 2 QPI Methodologies II  
**YongKeun Park**, KAIST (Korea, Republic of)
- 3 Cellular Biomechanics and Applications: Joint Session with  
Conferences 10067 and 10074  
**Kirill V. Larin**, University of Houston (United States)  
**YongKeun Park**, KAIST (Korea, Republic of)  
**Gabriel Popescu**, University of Illinois at Urbana-Champaign  
(United States)  
**David D. Sampson**, The University of Western Australia (Australia)
- 4 QPI Methodologies III  
**Gabriel Popescu**, University of Illinois at Urbana-Champaign  
(United States)
- 5 QPI of Cells and Tissues I  
**YongKeun Park**, KAIST (Korea, Republic of)
- 6 QPI of Cells and Tissues II  
**Gabriel Popescu**, University of Illinois at Urbana-Champaign  
(United States)
- 7 QPI Clinical Applications  
**YongKeun Park**, KAIST (Korea, Republic of)
- 8 QPI Algorithms and Image Processing  
**Gabriel Popescu**, University of Illinois at Urbana-Champaign  
(United States)