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# ***Quantitative Phase Imaging***

**Gabriel Popescu**

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*Editors*

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# Contents

vii	<i>Authors</i>
ix	<i>Conference Committee</i>
xi	<i>Introduction</i>

---

## SESSION 1 QPI METHODOLOGIES I

---

9336 03	<b>Path-length stabilized low-coherent reflection-type quantitative phase microscope for nanometer-resolution profiling of plasma membrane</b> [9336-2]
9336 09	<b>Differential fluorescence holography</b> [9336-8]
9336 0A	<b>Quantitative phase recovery from asymmetric illumination on an LED array microscope</b> [9336-9]

---

## SESSION 2 QPI METHODOLOGIES II

---

9336 0B	<b>Multiplexed off-axis interferometric phase microscopy for dynamic cell measurements (Invited Paper)</b> [9336-10]
9336 0C	<b>Using electrochemistry: total internal reflection imaging ellipsometry to monitor biochemical oxygen demand on the surface tethered polyelectrolyte modified electrode</b> [9336-11]
9336 0E	<b>Towards an incoherent off-axis digital holographic microscope</b> [9336-13]
9336 0F	<b>Fast control of temporal and spatial coherence properties of microscope illumination using DLP projector</b> [9336-14]
9336 0G	<b>Experimental setup combining Digital Holographic Microscopy (DHM) and fluorescence imaging to study gold nanoparticle mediated laser manipulation</b> [9336-15]
9336 0K	<b>Coherence-controlled holographic microscopy for live-cell quantitative phase imaging</b> [9336-19]

---

## SESSION 3 QPI METHODOLOGIES III

---

9336 0N	<b>Halo-free quantitative phase imaging with partially coherent light</b> [9336-22]
9336 0O	<b>Partially coherent phase imaging with source shapes estimation</b> [9336-23]
9336 0P	<b>Quantitative phase-shifting DIC using programmable spatial light modulators</b> [9336-24]

- 9336 0S **CINCH (Confocal Incoherent Correlation Holography) super resolution fluorescence microscopy based upon FINCH (Fresnel Incoherent Correlation Holography) (Invited Paper)** [9336-27]
- 9336 0T **Quantitative phase imaging through scattering media** [9336-28]

---

#### **SESSION 4 QPI ALGORITHMS AND IMAGING PROCESSING**

---

- 9336 0W **Fast processing of quantitative phase profiles from off-axis interferograms for real-time applications** [9336-32]
- 9336 0Z **C++ software integration for a high-throughput phase imaging platform** [9336-35]
- 9336 10 **Phase correction in low coherence diffraction phase microscopy using the optical transfer function** [9336-36]

---

#### **SESSION 5 QPI OF CELLS AND TISSUES I**

---

- 9336 12 **Holographic quantitative imaging of sample hidden by turbid medium or occluding objects** [9336-38]
- 9336 14 **Differentiating neutrophils using the optical Coulter counter** [9336-40]
- 9336 16 **Bright-field Quantitative Phase Microscopy (BFQPM) for accurate phase imaging using conventional microscopy hardware** [9336-42]
- 9336 17 **Multimodal label-free growth and morphology characterization of different cell types in a single culture with quantitative digital holographic phase microscopy (Invited Paper)** [9336-43]
- 9336 19 **Prostate cancer diagnosis using quantitative phase imaging and machine learning** [9336-45]

---

#### **SESSION 6 QPI METHODOLOGIES IV**

---

- 9336 1F **Quantitative phase imaging with programmable illumination** [9336-51]

---

#### **SESSION 7 QPI FOR INDUSTRIAL APPLICATIONS**

---

- 9336 1I **Semiconductor defect metrology using laser-based quantitative phase imaging** [9336-53]
- 9336 1K **In-situ measurements of nanoscale phenomena using diffraction phase microscopy** [9336-55]

---

**SESSION 8      QPI OF CELLS AND TISSUES II**

---

- 9336 1M      **Label-free measurements of membrane tether thickness using optical tweezers combined with SLIM** [9336-56]
- 9336 1Q      **Nuclear dynamics in metastatic cells studied by quantitative phase imaging** [9336-132]
- 9336 1R      **Diagnosis of breast cancer biopsies using quantitative phase imaging** [9336-61]
- 9336 1U      **QPI for prostate cancer diagnosis: quantitative separation of Gleason grades 3 and 4** [9336-64]
- 9336 1V      **3D quantitative phase imaging of neural networks using WDT** [9336-65]

---

**SESSION 9      QPI OF CELLS AND TISSUES III**

---

- 9336 1X      **Using digital inline holographic microscopy and quantitative phase contrast imaging to assess viability of cultured mammalian cells** [9336-67]
- 9336 1Y      **High throughput imaging of blood smears using white light diffraction phase microscopy** [9336-68]
- 9336 25      **Lab on chip optical imaging of biological sample by quantitative phase microscopy** [9336-75]

---

**POSTER SESSION**

---

- 9336 29      **Common-path diffraction optical tomography with a low-coherence illumination for reducing speckle noise** [9336-81]
- 9336 2G      **Method for observing phase objects without halos and directional shadows** [9336-88]
- 9336 2K      **Quantitative phase imaging of cellular and subcellular structures for non-invasive screening diagnostics of socially significant diseases** [9336-92]
- 9336 2M      **Multi-mode microscopy in real-time with LED array illumination** [9336-94]
- 9336 2P      **White-light interferometric microscopy for wafer defect inspection** [9336-98]



# 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.

Alieva, Tatiana, 0F	Kim, Myung K., 09
Antonopoulos, Georgios Christian, 0G	Kim, Taewoo, 1F, 1V
Anvari, Bahman, 1M	Kim, Youngchan, 29
Belyakov, Vladimir, 2K	Kim, Young-Jin, 29
Bhaduri, Basanta, 1Y	Kollárová, Vera, 0T
Bianco, V., 12	Křížová, Aneta, 0K
Brooker, Gary, 0S	Kuznetsov, Alexander, 2K
Bruce, Marc, 0S	Lee, KyeoReh, 29
Bryniarski, Casey, 2P	Li, Meng, 0C
Ceballos, Silvia, 1Q	Li, Xiuling, 1K
Chen, YanYan, 0C	Liu, S. Chris, 1V
Chmelík, Radim, 0K, 0T	Liu, Wei, 0C
Clark, David C., 09	Liu, Ziji, 2M
Čolláková, Jana, 0K, 0T	Lošťák, Martin, 0K
Dallmann, Marjorie F., 2P	Luo, Zelun, 0Z, 1R, 1Y
Dauwels, Justin, 0O	Lv, Bei'er, 0C
De Gol, P., 0E	Ma, Hongwei, 0C
Depeursinge, C., 0E	Macias, Virgilia, 19, 1R, 1U
Di Caprio, G., 14	Majeed, Hassaan, 0N, 1R, 1Y
Do, Minh N., 0N, 19	McKeown, Steven J., 1K
Dostál, Zbyněk, 0T	Memmolo, P., 12, 25
Edwards, Christopher A., 0N, 0P, 10, 1F, 1I, 1K, 2P	Merola, F., 12, 25
Emery, Y., 0E	Metelin, Vladislav, 2K
Ferraro, P., 12, 25	Meyer, Heiko, 0G
Frenklach, Irena, 0B	Miccio, L., 12, 25
Froeter, Paul J., 1K	Missan, Sergey, 1X
Gaylord, Thomas K., 16	Monemhaghdoost, Z., 0E
Gennari, O., 12, 25	Monroy, Freddy, 1Q
Gillette, Martha U., 1V	Montfort, F., 0E
Girshovitz, Pinhas, 0B, 0W	Moser, C., 0E
Goddard, Lynford L., 0N, 0P, 10, 1F, 1I, 1K, 2P	Mugnano, M., 25
Goto, Kentaro, 03	Nasyrov, Marat, 2K
Han, Kevin, 0Z, 1R, 1Y	Netti, P. A., 12, 25
Honma, Shu, 03	Nguyen, Tan H., 0N, 0P, 19
Hrytsenko, Olga, 1X	Ohde, Hisashi, 2G
Hwang, Suk-Won, 1K	Park, HyunJoo, 29
Iwai, Hidenao, 03	Park, YongKeun, 29
Iyer, Raj, 1V	Paturzo, Melania, 12
Jenkins, Micah, 16	Popescu, Gabriel, 0N, 0P, 0Z, 10, 19, 1F, 1I, 1K, 1Q, 1R, 1U, 1V, 1Y, 2P
Jin, Gang, 0C	Rakoski, Mirko Sebastian, 0G
Jůzová, Veronika, 0K	Ripken, Tammo, 0G
Kajdacsy-Balla, Andre, 19, 1R, 1U	Rodrigo, José A., 0F
Kajitani, Kazuo, 2G	Rogers, John A., 1K
Kalies, Stefan, 0G	Sarshar, Mohammad, 1M
Kandel, Mikhail E., 0Z, 1Q, 1R, 1Y	Schnekenburger, Jürgen, 17
Kastl, Lena, 17	Schonbrun, E., 14
Kemper, Björn, 17	Shaked, Natan T., 0B, 0W
Ketelhut, Steffi, 17	Shin, Seungwoo, 29
Kim, KyooHyun, 29	

Siegel, Nisan, 0S  
Slabý, Tomáš, 0K, 0T  
Sridharan, Shamira, 19, 1Q, 1U  
Steltner, Benjamin, 0G  
Storrie, Brian, 0S  
Sukhenko, Evgeniy, 2K  
Suzuki, Yoshimasa, 2G  
Tangella, Krishnarao, 1R, 1U, 1Y  
Tian, Lei, 0A, 0O, 2M  
Vasilenko, Irina, 2K  
Veselý, Pavel, 0K, 0T  
Waller, Laura, 0A, 0O, 2M  
Wibbeling, Jana, 17  
Wong, Winson T., 1M  
Yamashita, Yutaka, 03  
Yamauchi, Toyohiko, 03  
Zhong, Jingshan, 0O  
Zhou, Renjie, 1I, 2P



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- 2 QPI Methodologies II  
**Aydogan Ozcan**, University of California, Los Angeles (United States)  
**George Barbastathis**, Massachusetts Institute of Technology  
(United States)
- 3 QPI Methodologies III  
**Björn Kemper**, Westfälische Wilhelms-Universität Münster (Germany)  
**Myung K. Kim**, University of South Florida (United States)
- 4 QPI Algorithms and Imaging Processing  
**Laura Waller**, University of California, Berkeley (United States)
- 5 QPI of Cells and Tissues I  
**YongKeun Park**, KAIST (Korea, Republic of)  
**Gabriel Popescu**, University of Illinois at Urbana-Champaign  
(United States)
- 6 QPI Methodologies IV  
**YongKeun Park**, KAIST (Korea, Republic of)
- 7 QPI for Industrial Applications  
**Pietro Ferraro**, Istituto Nazionale di Ottica (Italy)
- 8 QPI of Cells and Tissues II  
**Demetri Psaltis**, Ecole Polytechnique Fédérale de Lausanne  
(Switzerland)  
**YongKeun Park**, KAIST (Korea, Republic of)
- 9 QPI of Cells and Tissues III  
**Audrey K. Ellerbee**, Stanford University (United States)  
**Peter T. C. So**, Massachusetts Institute of Technology (United States)

# Introduction

2015, The International Year of Light, marks also, in a fortunate coincidence, the launch of the first conference on Quantitative Phase Imaging (QPI) at Photonics West, BiOS. It was a tremendous success! For four full days, February 7–10, the QPI conference hosted a dense program of oral presentations, covering both novel methodologies and applications to biomedicine. Each presentation was followed by insightful comments, questions, and truly engaging discussions about the state of the art and future directions of the field. Including the poster presentations, the inaugural year of the conference included more than 100 contributions. Clearly, this is a strong message that the QPI field is maturing and that the timing for organizing the conference is right.



*Figure 1. A morning session during the QPI Conference at Photonics West, BiOS (San Francisco, 7-10 Feb. 2015)*

QPI is a special type of imaging that allows for quantitative biological investigations. It enables label-free quantitative assessment of biological samples, including cells and tissues. There has been a recent growth in the study of techniques and applications of QPI aimed at addressing important biological questions, previously not possible using conventional optical imaging techniques. This rapidly emerging field enables the investigation of cells and tissues in terms of morphology and dynamics with nanoscale sensitivity over temporal scales from milliseconds to days. Quantitative measurements of intrinsic properties, optical, chemical, and mechanical, are likely to open a new window into the pathophysiology of cells and tissues. Employing the principles of interferometry and holography, QPI provides unique capabilities not only for imaging, but for propagation of optical fields as well. As a result, QPI grants opportunities for non-iterative adaptive optics and for measuring light scattering. Thus, quantitative phase imaging has recently bridged the gap between the imaging and scattering disciplines.

This is the inaugural proceedings volume on Quantitative Phase Imaging. The papers published in this issue cover the latest developments and applications in one of the most extensive and fast growing fields in biomedical optics. The objective of this volume is to highlight recent progress and trends in novel optical technology developments, as well as their biological, clinical, and industrial applications. The papers published here can be categorized under the following major topics:

1. Imaging
2. Spectroscopy
3. Light scattering measurement
4. Algorithms and Imaging Processing in QPI
5. QPI of cells and tissues.

These topics are discussed in the contributed papers, covering original results and recent developments. Many of the papers published in this special issue represent in-depth elaboration of topics presented at the Quantitative Phase Imaging conference, Photonics West, BIOS, 2015. As Chairs of the QPI conference, we are grateful to the contributors to this volume and all the conference participants who have helped shape this exciting field of quantitative phase imaging.

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