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Optical Elastography and Tissue Biomechanics III

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Contents

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

CELLULAR AND EXTRACELLULAR MECHANICS

9710 05	The endogenous fluorescence of fibroblast in collagen gels as indicator of stiffness of the extracellular matrix [9710-4]
9710 07	Online monitoring of mechanical properties of three-dimensional tissue engineered constructs for quality assessment [9710-6]

NOVEL METHODS II

9710 0A	Dynamic phase-sensitive optical coherence elastography at a true kilohertz frame-rate [9710-9]
9710 0C	Optical coherence elastography for human finger-pad skin deformation studies [9710-11]
9710 0D	Lorentz force megahertz optical coherence elastography [9710-12]

BRILLOUIN ELASTOGRAPHY

9710 0G	High-speed elasticity-specific nonlinear Brillouin imaging/sensing via time-resolved optical (BISTRO) measurements [9710-15]
---------	---

ELASTOGRAPHY METHODS AND APPLICATIONS I

9710 0M	Combined optical coherence tomography and optical coherence elastography for glomerulonephritis classification [9710-20]
9710 0N	Depth-dependent displacement sensitivity analysis and the influence of Doppler angle for quantitative assessment of mechanical properties using phase-sensitive spectral domain optical coherence tomography [9710-21]
9710 0O	Robust strain mapping in optical coherence elastography by combining local phase-resolved measurements and cumulative displacement tracking [9710-22]

- 9710 0P **Mechanical characterization of the mouse diaphragm with optical coherence elastography reveals fibrosis-related change of direction-dependent muscle tissue stiffness** [9710-23]

ELASTOGRAPHY METHODS AND APPLICATIONS II

- 9710 0T **Revealing anisotropic properties of cornea at different intraocular pressures using optical coherence elastography** [9710-28]

COMPUTATION AND MODELING IN ELASTOGRAPHY I

- 9710 0X **Effect of curvature and thickness on elastic wave velocity in cornea-like structures by FEM and OCE** [9710-30]

- 9710 0Y **A comparative study of shear wave speed estimation techniques in optical coherence elastography applications** [9710-31]

COMPUTATION AND MODELING IN ELASTOGRAPHY II

- 9710 0Z **Experimental classification of surface waves in optical coherence elastography** [9710-32]

- 9710 10 **A three-dimensional solution for laser-induced thermoelastic deformation of the layered medium** [9710-33]

POSTER SESSION

- 9710 13 **Morphology and biomechanics of human heart** [9710-45]

- 9710 14 **Patient-specific modeling of human cardiovascular system elements** [9710-46]

- 9710 15 **Measurement of strain and strain rate in embryonic chick heart using spectral domain optical coherence tomography** [9710-47]

- 9710 16 **Skin surface and sub-surface strain and deformation imaging using optical coherence tomography and digital image correlation** [9710-48]

TISSUE MECHANICAL CONTRAST

- 9710 19 **Polarized spatial frequency domain imaging of heart valve fiber structure** [9710-37]

- 9710 1A **A comparison study of optical coherence elastography and laser Michelson vibrometry** [9710-38]

NOVEL METHODS III

- 9710 1F **Elasticity imaging of speckle-free tissue regions with moving acoustic radiation force and phase-sensitive optical coherence tomography [9710-43]**

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.

Aglyamov, Salavat R., 0T, 0X, 10
Alexandrov, Sergey, 0N
Allen, Alicia, 19
Baba Ismail, Yanny M., 07
Bagnaninchi, Pierre O., 07
Ballman, Charles W., 0G
Boadi, Joseph, 0C
Byers, R., 16
Carré, Matt J., 0C, 16
Chang, Anthony, 0M
Chelnokova, Natalia O., 13, 14
Chu, Ying-Ju, 0Y
Dou, Shidan, 15
Du, Yong, 0M
El Haj, Alicia J., 07
Emelianov, Stanislav Y., 10
Franco, W., 05
Franklin, Steven E., 0C, 16
Gelikonov, Grigory V., 0O
Gerhardt, L. C., 16
Gladkova, Natalia D., 0O
Golyadkina, Anastasiya A., 13, 14
Goth, Will, 19
Gubarkova, Ekaterina, 0O
Han, Zhaolong, 0D, 0M, 0T, 0X
Hsieh, Bao-Yu, 1F
Hsu, Thomas, 0M
Hu, Xuesong, 0C, 16
Ivanov, Dmitriy V., 13, 14
Kirillova, Irina V., 13, 14
Kistenev, Yury V., 1A
Kossovich, Leonid Yu., 14
Larin, Kirill V., 0A, 0D, 0M, 0P, 0T, 0X, 10, 1A
Larina, Irina V., 0P
Leahy, Martin, 0N
Lee, Z. S., 16
Lesicko, John, 19
Lewis, Roger, 0C, 16
Li, Jiasong, 0A, 0D, 0M, 0T, 0X, 1A
Li, Wei, 0C
Liang, Chengbo, 15
Liu, Chih-Hao, 0A, 0D, 0M, 0X, 1A
Liu, Jian, 15
Liu, X., 16
Loehr, James A., 0P
Lynch, Gillian, 0N
Ma, Zhenhe, 15
Maiti, Raman, 0C, 16
Matcher, Stephen J., 0C, 16
Matveev, Lev A., 0O
Matveyev, Alexander L., 0O
Meemon, Panomsak, 0Y
Meng, Zhaokai, 0G
Mohammadzai, Qais, 0M
Mohan, Chandra, 0M
Murylev, Vladimir V., 14
Nair, Achuth, 0A, 0T
Nguyen, Thu-Mai, 1F
Noorani, Shezaan, 0M
O'Donnell, Matthew, 1F
Ortega-Martinez, A., 05
Padilla-Martinez, J. P., 05
Parker, Kevin J., 0Y, 0Z
Petrov, Georgi I., 0G
Polienko, Asel V., 13, 14
Raghunathan, Raksha, 0D, 0M
Reinwald, Yvonne, 07
Rodney, George G., 0P
Rolland, Jannick P., 0Y, 0Z
Sacks, Michael S., 19
Schill, Alexander, 0A, 0D, 1A
Shen, Tueng, 1F
Singh, Manmohan, 0A, 0D, 0M, 0T, 0X, 1A
Song, Shaozhen, 1F
Subhash, Hrebesh, 0N
Suo, Yanyan, 15
Tunnell, James W., 19
Twa, Michael D., 0T, 0X
Vantipalli, Srilatha, 0X
Vitkin, Alex, 0O
Wang, Ruikang, 15, 1F
Wang, Shang, 0P, 10
Wang, Yi, 15
Wu, Chen, 0A, 0D, 0M, 0T, 0X
Xu, Tao, 15
Yakovlev, Vladislav V., 0G
Yang, Bin, 19
Yang, Ying, 07
Yao, Jianing, 0Y, 0Z
Yoon, Soon Joon, 1F
Zaitsev, Vladimir Y., 0O
Zhao, Yuqian, 15
Zvietcovich, Fernando, 0Y, 0Z

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Massachusetts General Hospital (United States)
Gabriel Popescu, University of Illinois at Urbana-Champaign
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- 3 Novel Methods II
Amy L. Oldenburg, The University of North Carolina at Chapel Hill
(United States)
- 4 Brillouin Elastography
Claude Boccara, Institut Langevin (France)
Ruikang K. Wang, University of Washington (United States)
- 5 Elastography Methods and Applications I
Qifa Zhou, The University of Southern California (United States)
Giuliano Scarcelli, University of Maryland (United States)
- 6 Elastography Methods and Applications II
Gijs van Soest, Erasmus MC (Netherlands)
Francesco S. Pavone, European Laboratory for Non-linear
Spectroscopy (Italy)
Kentaro Nakamura, Tokyo Institute of Technology (Japan)
- 7 Keynote Session
David D. Sampson, The University of Western Australia (Australia)
- 8 Computation and Modeling in Elastography I
Brendan F. Kennedy, The University of Western Australia (Australia)
Mathias Fink, Institut Langevin (France)
- 9 Computation and Modeling in Elastography II
Jiang Zhu, Beckman Laser Institute and Medical Clinic (United States)

- 10 Tissue Mechanical Contrast
Sean J. Kirkpatrick, Michigan Technological University (United States)
- 11 Novel Methods III
Donald D. Duncan, Portland State University (United States)
Seemantini K. Nadkarni, Harvard School of Medicine (United States)

Introduction

Optical elastography is the use of optics to characterize cells and tissues based on their mechanical properties. In utilizing the high-resolution capability of optics, this rapidly emerging field builds on and complements the related fields of ultrasound and MR elastography, as well as existing biomechanics methods, such as atomic force microscopy, cell indentation, micropipette aspiration, and particle rheology.

Mechanical forces play an important role in biological behavior and development at all spatial scales, from cells and their constituents to tissues and organs, and influence health, structural integrity, and normal function. High-resolution optical methods could help further the understanding of such mechanical interactions and properties in the cell mechanics and clinical diagnosis of a wide range of diseases. An important part of this contribution is expected to be the accurate determination of cell and tissue biomechanical properties, such as Young's or shear modulus.

This third annual conference continued the vibrant intellectual ambience of the first two conferences and displayed a strongly multidisciplinary character, bringing together technology and applications experts in bioengineering, biophysics, cell biology, clinical sciences, medical imaging, optics and photonics, and tissue engineering. This year, 49 contributed papers were built around 2.5 days of invited and contributed talks and posters. Exceptional keynote and invited speakers headlined the program:

Keynote:

Dennis E. Discher, University of Pennsylvania (United States), "Cells might not see where they are but they certainly feel the mechanics of their microenvironment!"

Invited:

Zhongping Chen, Beckman Laser Institute and Medical Clinic (United States), "Acoustic radiation force optical coherence elastography"

Brendan F. Kennedy, The University of Western Australia (Australia), "Compression optical coherence elastography for improved diagnosis of disease"

Seemantini K. Nadkarni, Harvard School of Medicine (United States), "Laser speckle rheology"

Assad A. Oberai, Rensselaer Polytechnic Institute (United States), "Inverse problems in biomechanical imaging"

This year's keynote speaker, Dennis E. Discher, provided insight on biomechanics at the cellular level. He provided a comprehensive overview of the role of mechanical forces during everyday cellular activity. Special acknowledgement goes to Thorlabs, Inc., whose sponsorship supported this keynote session. Highlights of this year's contributed program include the progress and impact made in Brillouin microscopy, and in both the shear wave and compression-based optical coherence elastography approaches. Applications in the anterior eye continued to grow, with some important progress in breast cancer and interesting new approaches to imaging skin and scar mechanical properties.

Optical Elastography and Tissue Biomechanics has confirmed its important place in supporting this emerging area – we look forward with excitement and anticipation to see what the next twelve months will bring. In the meantime, please enjoy reading the papers submitted for this volume.

Kirill V. Larin
David D. Sampson