PROGRESS IN BIOMEDICAL OPTICS AND IMAGING
Vol. 16 No. 25

Optical Elastography and Tissue Biomechanics II

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Editors

7–8 February 2015
San Francisco, California, United States

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Published by
SPIE

Volume 9327

Proceedings of SPIE, 1605-7422, V. 9327

Optical Elastography and Tissue Biomechanics II, edited by Kirill V. Larin, David D. Sampson
Proc. of SPIE Vol. 9327, 932701 · © 2015 SPIE · CCC code: 1605-7422/15/$18
doi: 10.1117/12.2192478

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Please use the following format to cite material from this book:
Author(s), "Title of Paper," in *Optical Elastography and Tissue Biomechanics II*, edited by Kirill V. Larin, David D. Sampson, Proceedings of SPIE Vol. 9327 (SPIE, Bellingham, WA, 2015) Article CID Number.

ISSN: 1605-7422
ISBN: 9781628414172

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

Printed in the United States of America.

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

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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 the behavior and development of cells at all spatial scales, from cells and their constituents, to tissues and organs. Such forces profoundly influence the health, structural integrity, and normal function of cells and organs. Accurate determination of cell and tissue biomechanical properties, such as Young's or shear modulus, is a vitally important area. High-resolution optical methods could help further the understanding of mechanical interactions and mechanical properties, with application to cell mechanics, clinical diagnosis, and the understanding of a wide range of diseases.

This second annual conference maintained the vibrant intellectual ambience of the first. It continued to display a strong 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, more than 42 contributed papers enhanced two days of invited presentations and posters (a 20% increase over last year). An exceptional keynote and invited speakers headlined the program:

Keynote:
Richard L. Ehman M.D., Mayo Clinic (United States), *MRI & mechanobiology: new science at the intersection of engineering and medicine*

Invited:
Jeffrey C. Bamber, The Institute of Cancer Research (United Kingdom), *Ultrasound elastography: current systems, ongoing research and future potential*

Claude Boccara, Institut Langevin (France), *Full field OCT and tissue elasticity measurements: a critical view*

Andrew E. Pelling, Univ. of Ottawa (Canada), *Simultaneous optical and mechanical probes to investigate complex cellular responses to physical cues*

Peter Török, Imperial College London (United Kingdom), *High numerical aperture Brillouin microscopy*

A highlight of this year's meeting was the insight provided by Richard Ehman and Jeff Bamber on magnetic resonance and ultrasound elastography, respectively. The insight that these allied but more mature fields provide into our own field is profound. Special acknowledgement goes to Thorlabs Inc., who sponsored and supported the Keynote Session. Other highlights included 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 made in breast cancer and interesting new approaches to imaging skin and scar mechanical properties. Optical Elastography and Tissue Biomechanics has confirmed its important role 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