PROGRESS IN BIOMEDICAL OPTICS AND IMAGING
Vol. 11, No. 36

Medical Imaging 2010

Biomedical Applications in Molecular, Structural, and Functional Imaging

Robert C. Molthen
John B. Weaver
Editors

14–16 February 2010
San Diego, California, United States

Sponsored by
SPIE

Cosponsored by
Medtronic, Inc. • Aeroflex, Inc. (United States) • Hamamatsu Photonics K.K. • OpenXi (United States) Tungsten Heavy Powder, Inc. (United States)

Cooperating Organizations
AAPM—American Association of Physicists in Medicine (United States) • APS—American Physiological Society (United States) • CARS—Computer Assisted Radiology and Surgery (Germany) • The Society for Imaging Science and Technology • Medical Image Perception Society (United States) • Radiological Society of North America (United States) • Society for Imaging Informatics in Medicine (United States) • SMI—The Society for Molecular Imaging The DICOM Standards Committee (United States)

Published by
SPIE

Volume 7626

Proceedings of SPIE, 1605-7422, v. 7626

The papers included 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. The papers published in these proceedings 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 this book:
Author(s), "Title of Paper," in *Medical Imaging 2010: Biomedical Applications in Molecular, Structural, and Functional Imaging*, edited by Robert C. Molthen, John B. Weaver, Proceedings of SPIE Vol. 7626 (SPIE, Bellingham, WA, 2010) Article CID Number.

ISSN 1605-7422
ISBN 9780819480279

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.

SPIE Digital Library
SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- 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, 0A, 0B … 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

Conference Committee

Symposium Chairs

Kevin Cleary, Georgetown University Medical Center (United States)
Maryellen Giger, The University of Chicago (United States)

Conference Chairs

Robert C. Molthen, Medical College of Wisconsin (United States)
John B. Weaver, Dartmouth Hitchcock Medical Center (United States)

Program Committee

Amir A. Amini, University of Louisville (United States)
Juan R. Cebral, George Mason University (United States)
Yu Chen, University of Maryland, College Park (United States)
Anne V. Clough, Marquette University (United States)
Andreas H. Hielscher, Columbia University (United States)
Eric A. Hoffman, The University of Iowa Hospitals and Clinics (United States)
Xiaoping P. Hu, Emory University (United States)
John F. LaDisa, Jr., Marquette University (United States), Medical College of Wisconsin (United States), and Children's Hospital of Wisconsin (United States)
Armando Manduca, Mayo Clinic College of Medicine (United States)
Erik L. Ritman, Mayo Clinic College of Medicine (United States)
Ronald M. Summers, National Institutes of Health (United States)
Merryn H. Tawhai, The University of Auckland (New Zealand)
Axel Wismueller, University of Rochester Medical Ctr. (United States)

Session Chairs

1 MRI Applications
Xiaoping P. Hu, Emory University (United States)
John B. Weaver, Dartmouth Hitchcock Medical Center (United States)

2 MRI Brain Imaging
Axel Wismueller, University of Rochester Medical Center (United States)

3 Brain and Cranial Imaging
Armando Manduca, Mayo Clinic College of Medicine (United States)

4 Heart and Vascular Imaging
Amir A. Amini, University of Louisville (United States)

5 Breast Imaging
Armando Manduca, Mayo Clinic College of Medicine (United States)
Axel Wismueller, University of Rochester Medical Center (United States)

6 Optical Imaging
Ronald M. Summers, National Institutes of Health (United States)

7 Lung Imaging
Merryn H. Tawhai, The University of Auckland (New Zealand)
Eric A. Hoffman, The University of Iowa Hospitals and Clinics (United States)

8 Modeling Photons and Structures
Andreas H. Hielscher, Columbia University (United States)

9 Keynote and Image-based Modeling
Robert C. Molthen, Medical College of Wisconsin (United States)

10 Nanoparticle and Microenvironment Imaging
John B. Weaver, Dartmouth Hitchcock Medical Center (United States)

11 Bone Imaging
Erik L. Ritman, Mayo Clinic College of Medicine (United States)

Poster Session
John F. LaDisa, Jr., Marquette University (United States), Medical College of Wisconsin (United States), and Children's Hospital of Wisconsin (United States)

Introduction

Southern California had perfect weather, not a cloud in site, and a record high temperature in store. The setting and atmosphere at and around the Town and Country Resort & Convention Center was unique and engaging. Outdoors, well-served symposium lunches, stimulating conversations, and an impressive group of papers combined to make the conference an undoubted success. Dr. Roderic Pettigrew, Director of National Institute of Biomedical Imaging and Bioengineering, resounded the importance of biomedical applications in health care and funded research throughout his Symposium Plenary; it was standing room only at the Biomedical Applications Conference Keynote where professor Peter Hunter presented a fascinating review of the Physiome Project and state-of-the-art work on image analysis and computational modeling of physiology in the heart. The Best Student Paper Award for the Biomedical Applications conference went to Tobias Knopp who gave an expert presentation on magnetic particle imaging in the Nanoparticle and Microenvironment Imaging session. The Honorable Mention Poster Awards went to Katelyn Russell for her work entitled "Dynamic ct head phantom for perfusion and angiographic studies" and Michael Delles for "Influence of imaging quality on magnetic resonance-based pressure gradient measurements." The Cum Laude Poster Award was presented to Kant Matsuda for his work entitled "Optical coherence tomography implied in implant bone interface investigation: numerical simulation and tensional stamps as complementary non invasive methods."

Considerable thanks goes to Merryn Tawhai, Eric Hoffman, Ching-Long Lin, and Kim Prisk, who all contributed to provide an informative and insightful workshop on image-based modeling and quantification of the lung and other organ systems. Dr. Tawhai graciously agreed to host the workshop and turned the opportunity into a magnificent interactive didactic tutorial.

Again this year, there were many excellent scientific presentations on various organ systems including brain, heart, lung, breast, bone, and vasculature. In addition, numerous imaging modalities were represented such that most clinical and preclinical techniques were well represented. Historically, one of the strengths of the Biomedical Applications conference is the presentation of direct applications of imaging to specific biomedical problems. The cogency of this is reflected in the following Proceedings.

A special thanks goes to the SPIE staff and the members of the Program Committee, without their efforts the conference and Proceedings would not exist.

We deeply appreciate your interest and support of this conference and look forward to your future involvement and continued outstanding presentations in the years to come.

Robert C. Molthen
John B. Weaver