Medical Imaging 2012

Advanced PACS-based Imaging Informatics and Therapeutic Applications

William W. Boonn
Brent J. Liu
Editors

8-9 February 2012
San Diego, California, United States

Sponsored by
SPIE

Cosponsored by
Agilent Technologies • Diamond SA (Switzerland) • DQE Instruments, Inc. (Canada)
eMagin (United States) • Isuzu Glass Co., Ltd. (Japan) • Medtronic. Inc. • Ocean Thin Films, Inc.
(United States)

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

Published by
SPIE

Volume 8319


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


ISSN 1605-7422
ISBN 9780819489685

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

Copyright © 2012, 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. 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 1605-7422/12/$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the 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 as 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

ix Conference Committee

xi Reflections on 30 years of PACS [8319-2] (Abstract Only)
J. Honeyman-Buck, Society for Imaging Informatics in Medicine (United States)

xiii Medical imaging, PACS, and imaging informatics: a personal perspective [8319-3] (Abstract Only)
H. K. Huang, Univ. of Southern California (United States)

xv Fortieth anniversary of SPIE Medical Imaging meeting (Overview Paper)
R. M. Nishikawa, Carl J. Vyborny Translation Lab. for Breast Imaging Research, The Univ. of Chicago (United States)

CLOUD AND MOBILE COMPUTING

8319 07 CEDIMS: cloud ethical DICOM image Mojette storage [8319-06]
J. Guédon, IRCCyN, CNRS, Univ. de Nantes (France); P. Evenou, IRCCyN, CNRS, Univ. de Nantes (France) and Fizians (France); P. Tervé, Keosys (France); S. David, Fizians (France); J. Béranger, Keosys (France)

8319 08 A cloud-based medical image repository [8319-07]
A. J. Maeder, B. M. Planitz, D. El Rifai, Univ. of Western Sydney (Australia)

8319 09 Performance evaluation of a visual display calibration algorithm for iPad [8319-08]
L. De Paepe, P. De Bock, Barco N.V. (Belgium); O. Vanovemeire, AZ Groeninge Hospital (Belgium); T. Kimpe, Barco N.V. (Belgium)

8319 0A A comprehensive framework for quality assurance in clinical trials [8319-09]
O. El Gazzar, M. Onken, M. Eichelberg, A. Hein, OFFIS e.V. (Germany); E. Kotter, Univ. Hospital Freiburg (Germany)

DATA MINING I

8319 0B Efficient similarity search on 3D bounding box annotations [8319-10]

8319 0C Implementation and application of an interactive user-friendly validation software for RADIANCE [8319-11]
A. Sundaram, Univ. of Pennsylvania (United States); W. W. Boonn, W. Kim, T. S. Cook, Hospital of the Univ. of Pennsylvania (United States)
Linking DICOM pixel data with radiology reports using automatic semantic annotation [8319-12]
S. D. Pathak, Microsoft Corp. (United States); W. Kim, The Hospital of the Univ. of Pennsylvania (United States); I. Munasinghe, A. Criminisi, Microsoft Research Cambridge (United Kingdom); S. White, K. Siddiqui, Microsoft Corp. (United States)

Medical image retrieval system using multiple features from 3D ROIs [8319-13]
H. Lu, W. Wang, Q. Liao, G. Zhang, Z. Zhou, Fourth Military Medical Univ. (China)

Multi-scale visual words for hierarchical medical image categorisation [8319-14]
D. Markonis, A. G. Seco de Herrera, I. Eggel, H. Müller, HES-SO (Switzerland)

Lesion comparison of multiple sclerosis in hispanic and caucasian patients utilizing an imaging informatics-based eFolder system [8319-15]
K. Ma, J. Fernandez, L. Amezqua, A. Lemer, M. Shiroishi, B. Liu, The Univ. of Southern California (United States)

Automating PACS quality control with the Vanderbilt image processing enterprise resource [8319-16]
M. L. Esparza, E. B. Welch, Vanderbilt Univ. (United States); B. A. Landman, Vanderbilt Univ. (United States) and Johns Hopkins Univ. (United States)

Design of e-Science platform for biomedical imaging research cross multiple academic institutions and hospitals [8319-17]
J. Zhang, Shanghai Institute of Technical Physics (China) and Shanghai Jiaotong Univ. (China); K. Zhang, Y. Yang, T. Ling, T. Wang, M. Wang, Shanghai Institute of Technical Physics (China); H. Hu, X. Xu, Shanghai Jiaotong Univ. (China)

Managing and querying whole slide images [8319-18]
F. Wang, T. W. Oh, Emory Univ. (United States); C. Vergara-Niedermayr, The Cancer Institute of New Jersey (United States); T. Kuc, J. Saltz, Emory Univ. (United States)

Synchronized slice viewing of similar image series [8319-19]
S. Ali, HES-SO (Switzerland) and Univ. de Bourgogne (France); A. Foncubierta, HES-SO (Switzerland); A. Depeursinge, HES-SO (Switzerland) and Univ. Hospitals and Univ. of Geneva (Switzerland); F. Meriaudeau, Univ. de Bourgogne (France); O. Ratib, Univ. Hospitals of Geneva (Switzerland); H. Müller, HES-SO (Switzerland) and Univ. Hospitals and Univ. of Geneva (Switzerland)

The impact of skull bone intensity on the quality of compressed CT neuro images [8319-20]
I. Kowalik-Urbaniak, E. R. Vrscay, Z. Wang, Univ. of Waterloo (Canada); C. Cavaro-Menard, Univ. de Angers (France); D. Koff, McMaster Univ. (Canada); B. Wallace, Agfa Healthcare, Inc. (Canada); B. Obara, Univ. of Oxford (United Kingdom)
<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>8319 0M</td>
<td>Retrieving biomedical images through content-based learning from examples using fine granularity [8319-21]</td>
<td>H. Jiang, The Univ. of Hong Kong (Hong Kong, China); S. Xu, Oak Ridge National Lab. (United States); F. C. M. Lau, The Univ. of Hong Kong (Hong Kong, China)</td>
</tr>
<tr>
<td>8319 0N</td>
<td>Comparative analysis of semantic localization accuracies between adult and pediatric DICOM CT images [8319-22]</td>
<td>D. Robertson, Microsoft Research Cambridge (United Kingdom); S. D. Pathak, Microsoft Corp. (United States); A. Criminisi, Microsoft Research Cambridge (United Kingdom); S. White, Microsoft Corp. (United States); D. Haynor, Univ. of Washington (United States); O. Chen, K. Siddiqui, Microsoft Corp. (United States)</td>
</tr>
<tr>
<td>8319 0O</td>
<td>Computer-assisted radiation treatment planning system for determination of beam directions based on similar cases in a database for stereotactic body radiotherapy [8319-23]</td>
<td>T. Magome, Kyushu Univ. (Japan) and Japan Society for the Promotion of Science (Japan); H. Arimura, Y. Shiroyama, A. Mizoguchi, C. Tokunaga, K. Nakamura, H. Honda, M. Ohki, F. Toyofuku, H. Hirata, Kyushu Univ. (Japan)</td>
</tr>
<tr>
<td>8319 0P</td>
<td>Creating a classification of image types in the medical literature for visual categorization [8319-24]</td>
<td>H. Müller, HES-SO (Switzerland) and Univ. Hospitals and Univ. of Geneva (Switzerland); J. Kalpathy-Cramer, Harvard Univ. (United States); D. Demner-Fushman, S. Antani, National Library of Medicine (United States)</td>
</tr>
<tr>
<td>8319 0Q</td>
<td>Data mining DICOM RT objects for quality control in radiation oncology [8319-25]</td>
<td>R. R. Deshpande, The Univ. of Southern California (United States); J. DeMarco, D. Low, Univ. of California, Los Angeles (United States); A. H. Le, Univ. of Pittsburgh (United States); B. J. Liu, The Univ. of Southern California (United States)</td>
</tr>
<tr>
<td></td>
<td><strong>THERAPY</strong></td>
<td></td>
</tr>
<tr>
<td>8319 0R</td>
<td>Web-based documentation system with exchange of DICOM RT for multicenter clinical studies in particle therapy [8319-26]</td>
<td>K. A. Kessel, Heidelberg Univ. Hospital (Germany); N. Bougatf, Heidelberg Univ. Hospital (Germany) and Heilbronn Univ. (Germany); C. Bohn, U. Engelmann, CHIL GmbH (Germany); D. Oetzel, Heidelberg Univ. Hospital (Germany); R. Bendl, Heilbronn Univ. (Germany); J. Debus, S. E. Combs, Heidelberg Univ. Hospital (Germany)</td>
</tr>
<tr>
<td>8319 0S</td>
<td>Utilization of DICOM multi-frame objects for integrating kinetic and kinematic data with raw videos in movement analysis of wheelchair users to minimize shoulder pain [8319-27]</td>
<td>R. R. Deshpande, H. Li, The Univ. of Southern California (United States); P. Requejo, Rancho Los Amigos National Rehabilitation Ctr. (United States); S. McNitt-Gray, The Univ. of Southern California (United States); P. Ruparel, Rancho Los Amigos National Rehabilitation Ctr. (United States); B. J. Liu, The Univ. of Southern California (United States)</td>
</tr>
</tbody>
</table>
The peer review system (PRS) for quality assurance and treatment improvement in radiation therapy [8319-28]
A. H. T. Le, Univ. of Pittsburgh Medical Ctr. (United States) and Univ. of Florida (United States); R. Kapoor, J. R. Palta, Univ. of Florida (United States)

A multimedia comprehensive informatics system with decision support tools for a multi-site collaboration research of stroke rehabilitation [8319-29]
X. Wang, J. Documet, K. A. Garrison, C. J. Weinstein, B. Liu, The Univ. of Southern California (United States)

An imaging informatics-based ePR (electronic patient record) system for providing decision support in evaluating dose optimization in stroke rehabilitation [8319-30]
B. J. Liu, C. Weinstein, X. Wang, M. Konersman, C. Martinez, N. Schweighofer, The Univ. of Southern California (United States)

A web-based electronic patient record (ePR) system for data integration in movement analysis research on wheel-chair users to minimize shoulder pain [8319-31]
R. R. Deshpande, The Univ. of Southern California (United States); P. Requejo, Rancho Los Amigos National Rehabilitation Ctr. (United States); E. Sutisna, X. Wang, M. Liu, S. McNitt-Gray, The Univ. of Southern California (United States); P. Ruparel, Rancho Los Amigos National Rehabilitation Ctr. (United States); B. J. Liu, The Univ. of Southern California (United States)

Creating a semantic lesion database for computer-aided MR mammography [8319-32]
X. Wang, Sunnybrook Research Institute (Canada); A. Martel, Sunnybrook Research Institute (Canada) and Univ. of Toronto (Canada)

Teleradiology network system using the web medical image conference system with a new information security solution [8319-33]
H. Satoh, Tokyo Health Care Univ. (Japan); N. Niki, Univ. of Tokushima (Japan); K. Eguchi, Teikyo Univ. (Japan); H. Ohmatsu, M. Kusumoto, M. Kaneko, R. Kakinuma, N. Moriyama, National Cancer Ctr. (Japan)

A comparison of image communication protocols in e-science platform for biomedical imaging research and applications [8319-34]
T. Wang, Y. Yang, Shanghai Institute of Technical Physics (China); H. Hu, Shanghai Jiao Tong Univ. (China); J. Zhang, Shanghai Institute of Technical Physics (China)

Semantic extraction and processing of medical records for patient-oriented visual index [8319-35]
W. Zheng, W. Dong, X. Chen, J. Zhang, Shanghai Institute of Technical Physics (China)

A new approach of building 3D visualization framework for multimodal medical images display and computed assisted diagnosis [8319-36]
Z. Li, Shanghai Institute of Technical Physics (China) and Henan Univ. of Science and Technology (China); J. Sun, J. Zhang, Shanghai Institute of Technical Physics (China)
MedCast: a discussion support system for cooperative work (Cum Laude Poster Award) [8319-37]
R. A. Moreno, Univ. of São Paulo Medical School (Brazil); V. Lima, I. Lopes, CPqD Foundation (Brazil); M. A. Gutierrez, Univ. of São Paulo Medical School (Brazil)

A computer-aided detection (CAD) system with a 3D algorithm for small acute intracranial hemorrhage [8319-38]
X. Wang, J. Fernandez, R. Deshpande, J. K. Lee, The Univ. of Southern California (United States); T. Chan, The Univ. of Hong Kong (Hong Kong, China); B. Liu, The Univ. of Southern California (United States)
Conference Committee

Symposium Chairs

Joseph M. Reinhardt, The University of Iowa (United States)
Nico Karssemeijer, Radboud University Nijmegen Medical Centre (Netherlands)

Conference Chairs

William W. Boonn, The University of Pennsylvania Health System (United States)
Brent J. Liu, The University of Southern California (United States)

Program Committee

James Chen, University of California, San Diego (United States)
Janice C. Honeyman-Buck, University of Florida (United States)
Steven C. Horii, The University of Pennsylvania Health System (United States)
Woojin Kim, The University of Pennsylvania Health System (United States)
Maria Y. Law, The Hong Kong Polytechnic University (Hong Kong, China)
Heinz U. Lemke, Computer Assisted Radiology and Surgery (Germany)
Khan M. Siddiqui, Microsoft Corporation (United States)
Eliot L. Siegel, University of Maryland Medical Center (United States)
John B. Strauss, Microsoft Corporation (United States)
Wyatt Tellis, University of California, San Francisco (United States)
Jianguo Zhang, Shanghai Institute of Technical Physics (China)
Stefan L. Zimmerman, The Johns Hopkins University (United States)

Session Chairs

1 PACS 30th Anniversary Session
   Heinz U. Lemke, Computer Assisted Radiology and Surgery (Germany)

2 Cloud and Mobile Computing
   Jianguo Zhang, Shanghai Institute of Technical Physics (China)

3 Data Mining I
   Janice C. Honeyman-Buck, University of Florida (United States)

4 PACS/Systems Integration
   Brent J. Liu, The University of Southern California (United States)
5  Data Mining II
   Maria Y. Law, The Hong Kong Polytechnic University (Hong Kong, China)

6  Therapy
   John B. Strauss, Microsoft Corporation (United States)
Reflections on 30 Years of PACS

J. Honeyman-Buck
JDI, Society for Imaging Informatics in Medicine,
508 Bramble Fern Ave, DeLand, FL 32720

1. INTRODUCTION

The papers selected for discussion here are just a small subset of the excellent work of these early innovators. The 1982 volume is an interesting read for all of us active in imaging informatics and in PACS. This presentation will look at early predictions and where we are now in 2012.

2. EARLY VISIONARIES

A preliminary review of the papers published in 1982 show us the remarkable forethought on the part of the authors. In many cases, their ideas lead to the PACS or Medical Imaging Informatics we know today.

2.1 Data Storage Requirements – Sam Dwyer, III - University of Kansas

Sam Dwyer and his colleagues at the University of Kansas estimated the volume of digital data that would need to be stored in a diagnostic imaging department serving a 614 bed hospital in 1982. His conclusions were that the cost of digital storage was 75% of the cost of analog and that it was feasible to store this volume. His projections for future storage requirements were remarkably accurate.

2.2 Digital PACS requirements – Andre J. Duerinckx

Andre J. Duerinckx argued that every radiology department has a PACS in the form of a centralized analog film file room managing both film and video raster film recordings used for imaging of digital diagnostic images. The challenge was to develop the technology for a digital PACS. His requirements list of technologies were right on track.

2.3 Benefits of PACS – Dr. Edward V. Staab, University of North Carolina

This early visionary believed that PACS would solve many of the problems in radiology arising from the rapidly increasing proliferation of imaging devices and the increasing numbers of subspecialties in radiology that hampered easy communication among radiologists. His list of advantages for digital PACS were remarkably accurate in time when many of the technologies required were not yet available.

3. IMAGE PROCESSING

Image processing was just starting to be investigated in 1982, but computing power was limited so researchers proposed different ways to manage the problem.

3.1 Overnight multi-planar reformatting – Michael Rhodes

Michael Rhodes described network image processing for CT scanners where one of the options was to perform Multi-Planar reformats on the computer overnight when the computers were less likely to be used.
3.2 Proposed requirements for an image processing system – G.Q. Maquire, Jr.

G.Q. Maguire, Jr., defines the image processing requirements with a proposed integrated systems approach. The problems reported at the time were the extremely long length of time it took to transfer data to a computer for viewing and when the data reside on tape, the length of time is even longer.

4. PACS AND TELERADIOLOGY

4.1 PACS Architectures – proposed by D. Meyer-Ebrect and Cliff Reader

Architectures for PACS were proposed by several authors.

4.2 Teleradiology – proposed by F.L. Skinner and Will Rasmussen

Both authors reported on prototype systems.

4.3 Prototype PACS Samuel J. Dwyer III and B.G. Thompson

Authors reported on prototype PACS being built at the University of Kansas and the University of North Carolina.

5. References


Medical Imaging, PACS and Imaging Informatics – A Personal Perspective

H. K. Huang*

*Image Processing and Informatics Laboratory, University of Southern California, 734 W Adams Blvd., Los Angeles, CA 90089

From my perspective, the development of medical imaging informatics research at IPILab (Imaging Processing and Informatics) has been incubated and evolved gradually through the past 40 years. The first 10 years from the early 70s to the early 80s was at the National Biomedical Research Foundation (NBR), Georgetown University, Washington D.C. During this period of time, medical imaging input devices, user interface, storage and computing methods were developed, which allowed hardcopy and video images to be converted to digital format, stored, processed and communicated. The list of inventions included the FIDAC (Film Input to Digital Automatic Computer (DAC)) [1], SPIDAC (Specimen Input to DAC) [2], VIDIAC (Vidicon Input to DAC), and DRIDAC (Drum Input to DAC) as well as the MACDAC (Man Machine Communication with DAC) and the IBM 360/44 computer (Figure 1). [3] In addition, the ACTA (Automatic Computerized Transverse Axial) CT scanner, the first whole body CT scanner, could acquire sectional images from patients and animals (Figure 2). [4]

Fig 1, 2, 3, 4a, 4b: Top, Lt to Rt: Pattern Recognition Lab, at NBR, The whole body ACTA Scanner; Bottom, Lt to Mid and Rt: Cross-section Anatomy, Pig Anatomy: A frozen section, CT image, and anatomical drawing
With these medical imaging devices as well as storage, display and computing subsystems, softcopy medical images became possible [5], in addition to visualization and manipulation of 2-D, 3-D and 4-D human and animal anatomy (Figures 3, 4a, and 4b). [6, 7]

In the past ten years, I retired from the University of California, and assumed my current positions at USC (2000-present) to establish the Imaging Processing and Information Laboratory (IPI Lab, Figure 7a, b), as well as at the Hong Kong Polytechnic University (2000-2010) to plan and design the PACS Lab, and to work on the total filmless healthcare delivery system in Hong Kong under the Hong Kong Hospital Authority auspices [9]. During the past ten years, the trends of medical imaging informatics research have shifted gradually from pure radiological diagnosis to medical imaging informatics-based diagnosis and treatment including surgery and radiation therapy and other clinical applications, as well as to embrace the development of healthcare delivery system.


REFERENCES

Fortieth Anniversary of SPIE Medical Imaging Meeting

Robert M. Nishikawa*
Carl J. Vyborny Translation Laboratory for Breast Imaging Research
Department of Radiology, and the Committee on Medical Physics, The University of Chicago, 5841 S. Maryland Ave. MC-2026, Chicago, IL 60637

This meeting marked the 40th year from the first SPIE Medical Imaging meeting. This paper presents a brief summary of the 40-year history of the meeting, with an emphasis on the Physics Conference. That is, when the meeting split into multiple conferences, data are presented mostly for the Physics conference only.

The first conference was held in 1972 in Chicago and it was called: Application of Optical Instrumentation in Medicine.

“We have endeavored, by way of the seminar, to provide a communication link between those with expertise in the various technologies associated with image forming devices and those in the medical field who rely on the fruits of these technologies for many of their diagnostic tools...there is a genuine interest among those in the medical field for a better understanding of the fundamental technology of imaging systems.” William C. Zarnstroff, General Chairman

For the next 40 years, with the exception of 1978 the meeting was held annually.

The first 13 conferences were entitled: Application of Optical Instrumentation in Medicine, appended with a roman numeral. The 14th meeting (1986) was modified to recognize the growing importance of PACS to the meeting: Application of Optical Instrumentation in Medicine XIV and Picture Archiving and Communication Systems (PACS IV) for Medical Applications. The following year, the conference name changed to “Medical Imaging” as it is known today, although the first 6 were denoted by roman numerals. Starting in 1993, the year was appended to the title.

The meeting started as a single track, two-day conference, and now has 8 distinct conferences covering five days plus an additional day of courses.

In 1988, the proceedings were published in two volumes, 914A and 914B. The former covering physics, image processing, and perception and the latter display and PACS. The following year (1989) each of those two split in two so that there were now four conferences:

1. Medical Imaging III: Image Formation
2. Medical Imaging III: Image Capture and Display
3. Medical Imaging III: Image Processing
4. Medical Imaging III: PACS System Design and Evaluation

These sessions were partially overlapping and, thus, for the first time, the meeting had parallel session.

This configuration of conferences remained until 1994 when Image Perception and Physiology and Function from Multidimensional Images were added. In 1997, Ultrasonic Transducer Engineering was added. In 2007, Computer-Aided Diagnosis was added.

From 1976 to 1983, the meeting was held in conjunction with or preceding the American Roentgen Ray Society. As a result, the location of the meeting changed annually. Starting in 1985, the meeting was held in Newport Beach, CA, and this was home for the next 10 years, except in 1991, the meeting was held in San Jose in conjunction with the Electronic Imaging meeting. In 1995, the meeting was then moved to San Diego, and then returned once more to Newport Beach, before moving to San Diego till 2009. Since 2009 the meeting has been alternating between San Diego and Lake Buena Vista, FL.

In the Introduction to the proceedings in 1984, Chairman Roger Schneider wrote:

This meeting, the twelfth in the series ... was intended to be a change in direction from recent meetings in the series, a reversion to the attack on fundamental problems in imaging which earlier meetings represented. We also desired to bring onto the floor a recognition that the scientific interest in imaging

* r-nishikawa@uchicago.edu | phone: 1-773-702-9047
is more broad and active now than it was a decade ago and that substantial progress has been made in formulating at least the structure of an understanding of the conveyance of information to human observers through imaging channels. ... We recognized the current intense interest in development of medical systems based upon the most contemporary image communication and storage technologies, and included that topic. The design goal was to address the physics and statistics of image encoding by modality; and the processing, display, archiving, management, and psychophysical considerations independently of modality, as far as possible.

It took 2 years for this new emphasis to flourish. Beginning in 1986, the attendance and the number of papers increased rapidly (as can be seen in the plots below).

Finally, it is important to note that every year for the past 40 years, the Center for Devices and Radiological Health, FDA (formerly, the Bureau for Radiological Health) has been a cosponsor or supporting organization. Further, many members of the CDRH/BRH have helped organize the meeting, such as Robert Wagner, Robert Jennings, Roger Schneider, David Brown and several others. Their contributions to this meeting mirror the impact that the CDRH/BRH have had on the field.

Figure 1. These plots capture some of the statistics from the meeting over time.

1.1 Fun Facts

Bob Wagner dubbed 1984-1987, the Palindrome Years.
The first digital mammography paper and the first dual-energy mammography paper were presented in 1983.
The first computer-aided diagnosis (CAD) paper was presented in 1985.
The first Proceedings (Vol. 35) had a black cover and was hard bound. All subsequent Proceedings had a yellow cover and were soft bound.
The first posters were in 1988. Each poster had 3 full poster boards and wine was served at the poster session.
Although there was no “Medical Imaging” meeting in 1978, there was another medical imaging themed conferences: Recent and Future Developments in Medical Imaging I; edited by Norman A. Baily.

In 2001, the proceedings were distributed on CD for the first time.

Table 1. Number of years serving as a Conference Chair (includes all Conferences) or serving on the Physics Committee (including being Chair). Years on Physics Committee includes committee membership when there was only a single conference and only the Physics Committee when there were multiple conferences.

<table>
<thead>
<tr>
<th>Years Served as a Conference Chair</th>
<th>Years Served on Physics Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samuel J. Dwyer III</td>
<td>Robert F. Wagner</td>
</tr>
<tr>
<td>Roger H. Schneider</td>
<td>Hans Roehrig</td>
</tr>
<tr>
<td>R. Gilbert Jost</td>
<td>Martin J. Yaffe</td>
</tr>
<tr>
<td>Yongmin Kim</td>
<td>Robert J. Jennings</td>
</tr>
<tr>
<td>William R. Hendee</td>
<td>Harrison H. Barrett</td>
</tr>
<tr>
<td>Anne V. Clough</td>
<td>Arthur E. Burgess</td>
</tr>
<tr>
<td>Murray H. Loew</td>
<td>James T. Dobbins III</td>
</tr>
<tr>
<td>Joel E. Gray</td>
<td>John M. Boone</td>
</tr>
<tr>
<td>Kenneth M. Hanson</td>
<td>Richard L. Van Metter</td>
</tr>
<tr>
<td>Steven C. Horii</td>
<td>Rodney Shaw</td>
</tr>
<tr>
<td>Arthur G. Haus</td>
<td>Roger H. Schneider</td>
</tr>
<tr>
<td>Elizabeth A. Krupinski</td>
<td>John Yorkston</td>
</tr>
<tr>
<td>Eric A. Hoffman</td>
<td>Kunio Doi</td>
</tr>
<tr>
<td>Harold L. Kundel</td>
<td>Larry E. Antonuk</td>
</tr>
<tr>
<td>K. Kirk Shung</td>
<td>Stephen W. Smith</td>
</tr>
<tr>
<td>Seong K. Mun</td>
<td>Bruce R. Whiting</td>
</tr>
<tr>
<td>William F. Walker</td>
<td>Jacob Beutel</td>
</tr>
<tr>
<td></td>
<td>Arthur G. Haus</td>
</tr>
<tr>
<td></td>
<td>Ian A. Cunningham</td>
</tr>
<tr>
<td></td>
<td>John A. Rowlands</td>
</tr>
<tr>
<td></td>
<td>Judith M. S. Prewitt</td>
</tr>
<tr>
<td></td>
<td>Kenneth M. Hanson</td>
</tr>
<tr>
<td></td>
<td>Michael J. Flynn</td>
</tr>
<tr>
<td></td>
<td>Murray H. Loew</td>
</tr>
<tr>
<td></td>
<td>Robert A. Kruger</td>
</tr>
<tr>
<td></td>
<td>Robert M. Nishikawa</td>
</tr>
<tr>
<td></td>
<td>Samuel J. Dwyer III</td>
</tr>
<tr>
<td></td>
<td>Stephen R. Thomas</td>
</tr>
<tr>
<td></td>
<td>Steven C. Horii</td>
</tr>
<tr>
<td></td>
<td>Thomas G. Flohr</td>
</tr>
</tbody>
</table>

1.2 Summary of Each Meeting

Following is a brief summary of each meeting from 1972-2012. When there were multiple conferences at the meeting, the summary focuses mainly on the Physics Conference. I also have most of this information in an excel spreadsheet. It is available from the author to those who would like it.
Overview of the 40-Year History of the SPIE Medical Imaging Meeting

1972
Application of Optical Instrumentation In Medicine (In-depth-Seminar)
Chicago Nov 29-30
Vol. 35 95 papers Attendance: n/a
Sponsors, Co-Sponsors & Supporting Organizations
SPIE, BRH, ASNR, SMM, UWM, AAPM
Chairs
William C. Zarmstoff, William R. Hendee, Paul L. Carson
Program Committee
Not listed
Sessions
Electro-Optical Instrumentation - William R. Hendee
Image Analysis, Enhancement and Evaluation - Paul L. Carson
Holographic and Video Images - William R. Hendee
Special Topics - William C. Zarmstoff
Panel Discussion - Jock B. Krohmer

1973
Application of Optical Instrumentation in Medicine II
Chicago Nov 29-30
Vol. 43 35 papers Attendance: n/a
Sponsors, Co-Sponsors & Supporting Organizations
SPIE, AAPM, ASNR, AAMI, BRH-EMBG, OSA, SMM, SRE, SPSE
Chairs
William R. Hendee, William C. Zarmstoff, Paul L. Carson
Program Committee
Not listed
Sessions
Nuclear Medicine Imaging
Image Enhancement and Pattern Recognition
Panel Discussion: Image Enhancement for Medical Diagnosis Can It Be Effective?
Special Topics
Image Intensifier Systems
Transmission, Storage, Retrieval and Reconstruction of Images
Panel Discussion: Performance Standards and Possible Field Evaluation of Image Intensifiers
Performance Standards of Image Intensifiers

1974
Application of Optical Instrumentation in Medicine III
Kansas City, MO Aug 1-2
Vol. 47 45 papers Attendance: n/a
Sponsors, Co-Sponsors & Supporting Organizations
SPIE, BRH, AAPM, ARRS, EMBG
Chairs
Paul L. Carson, Edward L. Chaney, William R. Hendee
Program Committee
Not listed
Sessions
Transmission 3-Dimensional Image Reconstruction and Computerized Axial Tomography - William R. Hendee, Joseph Gallagher
Advanced Techniques of Imaging With Ultrasound - Paul L. Carson
Acoustic Exposure Determination In Diagnostic Ultrasound - James A. Rooney
Noise, Objective, and Psychophysical Measures - Joel E. Gray
Special Topics - Jacques Ovadia
Ray Tube Focal Spot Size and Intensity Distributions: Important Practical Considerations - Bent E. Bjerregaard
Automatic Brightness Control In Image-Intensified Fluoroscopy - William R. Hendee

1975
Application of Optical Instrumentation in Medicine IV
Atlanta, GA Sept. 25-27
Vol. 70 55 papers Attendance: n/a
Sponsors, Co-Sponsors & Supporting Organizations
SPIE, BRH, AAPM, ARRS, ACR, SRE
Chairs
Joel E. Gray, William R. Hendee
Program Committee
Not listed
Sessions
Quality Assurance, Film Handling & Film Processing - Joel E. Gray
Loading, Heat Rating, Other Characteristics of X-Ray Tubes - Edward L. Chaney
Information Extraction & Utilization From Radiologic Images - Marvin E. Haskin
Quality Assurance In Diagnostic Radiology: Why Doesn't Every Department Have A Complete Program? Panel Discussion
Quality Assurance for Diagnostic Radiologic Instrumentation - James J. Vuich
Exposure Initiation/termination Mechanisms and Automatic Exposure Timers In diagnostic Radiology - Robert G. Waggener
Rare Earth Intensifying Screens - E. Dale Trout
Panel Discussion: Performance Specifications for Diagnostic Radiologic Equipment - Gray-Scale Ultrasound Imaging & Tissue Identification - Paul L. Carson
Physical Evaluation of Computerized Axial Tomography - Raymond P. Rossi
Special Topics - Robert Roifner
Performance Evaluation of Mammographic Imaging Systems - Gregory L. Dubaque
1976

Application of Optical Instrumentation in Medicine V

Washington, DC  Sept. 16-19
Vol. 96  76 papers  Attendance: n/a

Sponsors, Co-Sponsors & Supporting Organizations
SPIE, BRH, ARRS, SRE

Chairs

Program Committee
Same as Editors

Sessions
- Quality Assurance in Diagnostx: Radiology I: Raymond P. Rossi
- Quality Assurance in Diagnostic Radiology II: Thomas Stone
- Computed Tomography I: Norman A. Baily
- Radiographic Imaging and Dose: Arthur G. Haus
- Computed Tomography II: Rodney A. Brooks
- Computed Tomography III: Kenneth Weiner
- Diagnostic Ultrasound I: Paul L. Caven
- Quality Assurance in Diagnostic Radiology III: Robert K. Carak
- Current Topics in Mammography: Gregory Dubuque

1977

Application of Optical Instrumentation in Medicine VI

Bretton, MA  Sept. 25-27
Vol. 127  60 papers  Attendance: n/a

Sponsors, Co-Sponsors & Supporting Organizations
SPIE, BRH, ARRS, SRE

Chairs
Joel E. Gray, William R. Hendee

Program Committee
Robert F. Wagner, William Properzio, Arthur G. Haus, Joel Pierce Jones, Raymond Rossi

Sessions
- The Laboratory/Clinical Interface in Image Evaluation: Robert Wagner
- Sensitometry Up-Date: Joel Gray
- Screen Film Systems and Photostimulable Materials: Arthur G. Haus
- Approaches to Equipment Service, Equipment Specification and Performance Evaluation: Raymond P. Rossi
- New Developments in Medical Imaging: William Hendee
- Quality Control in Medical Imaging: William S. Properzio
- Performance Characteristics of CT Scanners: Robert K. Carak
- Small Group Sessions on Special Topics: Joint Session with ARRS

1978

No Meeting

1979

Application of Optical Instrumentation in Medicine VII

Toronto, Canada  Mar. 25-27
Vol. 173  55 papers  Attendance: n/a

Sponsors, Co-Sponsors & Supporting Organizations
SPIE, SPSE, ARRS, BRH, SRE

Chairs
Joel E. Gray

Program Committee

Sessions
- Imaging Systems: Physical Evaluation: Joel Gray
- Imaging Systems: Perception Evaluation: Joel Gray
- Imaging Systems: Spatial/Tissue Considerations: Arthur Haus
- Mammography: William Properzio
- Special Topics: Raymond Rossi
- Computed Tomography: Practical/Considerations: William R. Hendee
- Computed Tomography: Theoretical Considerations: William R. Hendee
- X-Ray Imaging Research in Toronto: K. W. Taylor
- Joint Session with the ARRS: Joel Gray; William R. Hendee; Harry Z. Melvine

xix
### 1980

Application of Optical Instrumentation in Medicine VIII  
Las Vegas, NV  
Apr 20-22  
Vol. 233  45 papers  
Attendance: N/A  

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE, SPIE, ARRS, AAPM, BRH, SRE

**Chairs**  
Joel Gray, Arthur G. Haus, William R. Hendee, William S. Prosperio

**Program Committee**  
Same as Editors

**Sessions**
- Screen-Film Evaluation - Arthur G. Haus  
- Unconventional Imaging Techniques - Joel Gray
- Special Topics - Gerald Cohen
- New Concepts in Conventional Imaging Techniques - James A. Mulvaney
- How Might Exposure Values Be Determined for Radiological Exams - William S. Prosperio
- Joint Session with the ARRIS - Joel Gray; Joseph Cahoun

### 1981

Application of Optical Instrumentation in Medicine IX  
San Francisco, CA  
Mar 22-24  
Vol. 273  51 papers  
Attendance: N/A

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE, SPIE, AAPM, ARRS, BRH, SRE

**Chairs**  
Joel E. Gray, Arthur G. Haus, William S. Prosperio, James A. Mulvaney

**Program Committee**  
Same as Editors

**Sessions**
- Special Session: Nuclear Magnetic Resonance Imaging - Current Status - Leon Panten; A. E.vente James, Jr.
- Conventional Imaging Systems Evaluation - Arthur G. Haus
- Digital Radiography - William S. Prosperio
- Quality Control - James A. Mulvaney
- Nuclear Medicine - Joel E. Gray
- Break-Out Session A: Nuclear Magnetic Resonance - C. Leon Panten
- Break-Out Session B: Computerized Tomography - Gary D. Fullerton
- Break-Out Session C: Digital Imaging - William S. Prosperio
- Break-Out Session D: Conventional Imaging Systems Evaluation - Joel E. Gray
- Joint Session with the ARRIS - Arthur G. Haus, James F. Martin
- Recording, Storage, and Processing of Images - Joel E. Gray

### 1982

Application of Optical Instrumentation in Medicine X  
New Orleans  
May 9-12  
Vol. 347  89 papers  
Attendance: 300

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE, ARRS, AAMR, BRH, ISBE

**Chairs**  
Gary D. Fullerton, Arthur G. Haus, William S. Prosperio, James A. Mulvaney

**Program Committee**  
Same as Editors

**Sessions**
- Special Session on Digital Radiography - Benjamin A. Arnold; Andrew B. Chunn
- Conventional Imaging Systems Evaluation - Arthur G. Haus
- Digital Radiography - William S. Prosperio
- Computed Tomography - James A. Mulvaney
- Conventional Imaging Systems Evaluation - Charles A. Ketley
- Break-Out Session A: Digital Radiography - William S. Prosperio
- Break-Out Session B: Conventional Imaging - James A. Mulvaney
- Break-Out Session C: Nuclear Magnetic Resonance (NMR) Imaging - Gary D. Fullerton
- Joint Session with the ARRIS - John Tampax; Gary D. Fullerton
- Digital Radiology (Co-sponsored by ARRS and SPIE) - M. Paul Capp; William R. Hendee
- Integrated Systems for Analysis and Display of Radiological Images - Michael J. Flynn
- Nuclear Magnetic Resonance (NMR) (Co-sponsored by ARRS and SPIE) - Michael J. Flynn
- Nuclear Magnetic Resonance (NMR) - Raymond L. Normall
- Nuclear Magnetic Resonance (NMR) (Co-sponsored by ARRS and SPIE) - A. E.vente James, Raymond L. Normall

### 1983

Application of Optical Instrumentation in Medicine XI  
Atlanta  
Apr 17-23  
Vol. 419  41 papers  
Attendance: 296

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE, ARRS, AAPM, BRH, SPIE, SRE

**Chairs**  
Gary D. Fullerton

**Program Committee**  
Arthur G. Haus, James A. Mulvaney, William Prosperio

**Sessions**
- Advances in Digital Imaging - Roger S. Powell
- Conventional Imaging Systems Evaluation - Arthur G. Haus
- Digital Radiography I - James A. Mulvaney
- Image Performance Evaluation and Quality Assurance - William S. Prosperio
- Digital Radiography II - Stewart C. Bushong
- Break-Out Session A: Nuclear Magnetic Resonance Imaging - Gary D. Fullerton
- Break-Out Session B: Digital Radiography - William S. Prosperio
- Break-Out Session C: Conventional Imaging - James A. Mulvaney
- Joint Session with SPIE and the ARRIS - Rezin M. Fitzger; Gary D. Fullerton
- Nuclear Magnetic Resonance Imaging - Gary D. Fullerton
- New Modalities and Computers in Medical Imaging - Michael J. Flynn
### 1992

**Medical Imaging VI: Instrumentation**  
Newport Beach, CA  23-24 February  
Vol. 1651  221 papers (27 in Physics)  Attendance: 539

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE, AAPM, CDRH, NEMA, IS&T

**Chairs**  
Rodney Shaw

**Program Committee**  
Harrison H. Barrett; David G. Brown; Arthur E. Burgess; William J. Dallas;  
Kunio Doi; Aaron Gartner; Robert J. Jennings; Robert A. Kruger; Pau-Teck Lim;  
Richard L. Morin; Ohara Nakagoh; Hans Roehrig; Roger H. Schneider;  
Stephen W. Smith; Stephen R. Thomas; Robert F. Wagner

**Sessions**  
- Image Instrumentation I: David G. Brown  
- Image Instrumentation II: Arthur E. Burgess  
- Image Instrumentation III: William J. Dallas  
- Image Instrumentation IV: Hans Roehrig  
- Poster Session

### Other Conferences

<table>
<thead>
<tr>
<th>Vol #</th>
<th>Title</th>
<th>Editor/Conference Chair</th>
<th># of papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1652</td>
<td>Image Processing</td>
<td>Murray H. Loew</td>
<td>74</td>
</tr>
<tr>
<td>1653</td>
<td>Image Capture, Formatting, and Display</td>
<td>Yongmin Kim</td>
<td>51</td>
</tr>
<tr>
<td>1654</td>
<td>PACS Design and Evaluation</td>
<td>R. Gilbert Jost</td>
<td>69</td>
</tr>
</tbody>
</table>

### 1993

**Medical Imaging 1993: Physics of Medical Imaging**  
Newport Beach, CA  14-15 February  
Vol. 1896  250 papers (45 in Physics)  Attendance: 754

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE, AAPM, CDRH, NEMA, IS&T, SCAR

**Chairs**  
Rodney Shaw

**Program Committee**  
Jacob Beutel; Arthur E. Burgess; Robert J. Jennings; Hans Roehrig;  
Richard L. Van Meter; Robert F. Wagner

**Sessions**  
- Physics of Medical Imaging I: Robert F. Wagner  
- Physics of Medical Imaging II: Rodney Shaw  
- Physics of Medical Imaging III: Hans Roehrig  
- Physics of Medical Imaging IV: Robert F. Wagner  
- Physics of Medical Imaging V: Robert J. Jennings  
- Physics of Medical Imaging VI: Jacob Beutel  
- Physics of Medical Imaging VII: Richard L. Van Meter

### Other Conferences

<table>
<thead>
<tr>
<th>Vol #</th>
<th>Title</th>
<th>Editor/Conference Chair</th>
<th># of papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1697</td>
<td>Image Capture, Formatting, and Display</td>
<td>Yongmin Kim</td>
<td>51</td>
</tr>
<tr>
<td>1698</td>
<td>Image Processing</td>
<td>Murray H. Loew</td>
<td>86</td>
</tr>
<tr>
<td>1699</td>
<td>PACS Design and Evaluation</td>
<td>R. Gilbert Jost</td>
<td>68</td>
</tr>
</tbody>
</table>

### 1994

**Medical Imaging 1994: Physics of Medical Imaging**  
Newport Beach, CA  13-14 February  
Vol. 2163  349 papers (63 in Physics)  Attendance: 1073

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE, AAPM, CDRH, NEMA, IS&T, RSC, RSNA, SCAR

**Chairs**  
Rodney Shaw

**Program Committee**  
Jacob Beutel; John M. Boone; Randolph P. Brown; Robert J. Jennings;  
Hans Roehrig; Richard L. Van Meter; Robert F. Wagner; Martin J. Yaffe

**Sessions**  
- Physics of Medical Imaging I: Hans Roehrig  
- Physics of Medical Imaging II: Martin J. Yaffe  
- Physics of Medical Imaging III: Randall P. Brown  
- Physics of Medical Imaging IV: Robert J. Jennings  
- Physics of Medical Imaging V: John M. Boone  
- Physics of Medical Imaging VI: Jacob Beutel  
- Physics of Medical Imaging VII: Richard L. Van Meter

### Other Conferences

<table>
<thead>
<tr>
<th>Vol #</th>
<th>Title</th>
<th>Editor/Conference Chair</th>
<th># of papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2164</td>
<td>Image Capture, Formatting, and Display</td>
<td>Yongmin Kim</td>
<td>55</td>
</tr>
<tr>
<td>2165</td>
<td>PACS Design and Evaluation</td>
<td>R. Gilbert Jost</td>
<td>97</td>
</tr>
<tr>
<td>2166</td>
<td>Image Perception</td>
<td>Harold L. Kundel</td>
<td>24</td>
</tr>
<tr>
<td>2167</td>
<td>Image Processing</td>
<td>Murray H. Loew</td>
<td>88</td>
</tr>
<tr>
<td>2168</td>
<td>Image Processing</td>
<td>Eric A. Hoffman, Raj S. Acharya</td>
<td>49</td>
</tr>
</tbody>
</table>

### 1995

**Medical Imaging 1995: Physics of Medical Imaging**  
San Diego, CA  26-27 February  
Vol. 2432  349 papers (63 in Physics)  Attendance: 1074

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE, AAPM, CDRH, IS&T, NEMA, RSC, RSNA, SCAR

**Chairs**  
Richard L. Van Meter, Jacob Beutel

**Program Committee**  
Larry E. Antonuk; Gary T. Barnes; John M. Boone; Randall P. Brown; Ian A. Cunningham; Frank A. DiBiase; James T. Dobkins; Robert J. Endorf; Robert J. Jennings; Hans Roehrig; Robert F. Wagner; Martin J. Yaffe; Herbert D. Zeman

**Sessions**  
- Image Quality and X-Ray Physics I: John M. Boone  
- Image Quality and X-Ray Physics II: Robert J. Jennings  
- Image Quality and X-Ray Physics III: Hans Roehrig  
- Physics of Ultrasonic Imaging: Randall P. Brown  
- Novel Detectors for Digital Radiography I: Martin J. Yaffe  
- Novel Detectors for Digital Radiography II: Frank A. DiBiase  
- Novel Detectors for Digital Radiography III: Ian A. Cunningham  
- Digital Radiography System Performance: Larry E. Antonuk

### Other Conferences

<table>
<thead>
<tr>
<th>Vol #</th>
<th>Title</th>
<th>Editor/Conference Chair</th>
<th># of papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2431</td>
<td>Image Display</td>
<td>Yongmin Kim</td>
<td>61</td>
</tr>
<tr>
<td>2432</td>
<td>Physiology and Function from Multidimensional Images</td>
<td>Eric A. Hoffman</td>
<td>47</td>
</tr>
<tr>
<td>2433</td>
<td>Image Processing</td>
<td>Murray H. Loew</td>
<td>94</td>
</tr>
<tr>
<td>2435</td>
<td>PACS Design and Evaluation</td>
<td>R. Gilbert Jost, Samuel J. Deyer III</td>
<td>67</td>
</tr>
<tr>
<td>2436</td>
<td>Image Perception</td>
<td>Harold L. Kundel</td>
<td>19</td>
</tr>
</tbody>
</table>
1996
Medical Imaging 1996: Physics of Medical Imaging
Newport Beach, CA  11-13 February
Vol. 2708  362 papers (79 in Physics)  Attendance: 566
Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CDRH; IS&T; NEMA; RISC; RSNA; SCAR
Chairs
Richard L. Van Metter, Jacob Beutel
Program Committee
Larry E. Antonuk; Gary T. Barnes; John M. Boone; Randall P. Brown; Ian A. Cunningham; Frank A. DiBianca; James T. Dobbins III; Robert J. Endorf; Hans Roesler; Robert F. Wagner; Martin J. Yaffe; Herbert D. Zierman
Sessions
Plenary Session - Robert Wagner
New Concepts in Information Theory - Hans Roesler
Image Quality and X-Ray Physics I - John M. Boone
Image Quality and X-Ray Physics II - John M. Boone
Image Quality and X-Ray Physics III - Robert J. Endorf
Mammographic Imaging - Martin J. Yaffe
Ultrasound - Herbert D. Zierman
Volume Imaging I - Frank A. DiBianca
Volume Imaging II - Frank A. DiBianca
Detectors for Digital Radiography I - Larry E. Antonuk
Detectors for Digital Radiography II - James T. Dobbins III
Other Conferences
Vol #  Title  Editor/Conference Chair  papers
2707  Image Display  Yongmin Kim  65
2709  Physiology and Function from Multidimensional Images  Eric A. Hoffman  49
2710  Image Processing  Murray Lee, Kenneth Hanson  102
2711  PACS Design and Evaluation: Engineering and Clinical Issues  Dwyer III  66
2712  Image Perception  Harold L. Kundel  21

1997
Medical Imaging 1997: Physics of Medical Imaging
San Jose, CA  Feb 23-25
Vol. 3032  451 papers (57 in Physics)  Attendance: 1021
Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CDRH; IS&T; NEMA; RISC; RSNA; SCAR
Chairs
Richard L. Van Metter, Jacob Beutel
Program Committee
Larry E. Antonuk; Gary T. Barnes; John M. Boone; Ian A. Cunningham; Frank A. DiBianca; James T. Dobbins III; Robert J. Endorf; Gary S. Keyses; Hans Roesler; Robert F. Wagner; Martin J. Yaffe; Herbert D. Zierman
Sessions
Image Acquisition I - John M. Boone
Image Acquisition II - Frank A. DiBianca
Imaging Physics I - Robert F. Wagner
Imaging Physics II - Hans Roesler
Volume Imaging I - Herbert D. Zierman
Volume Imaging II - Robert J. Endorf
Mammographic Imaging - Martin J. Yaffe
Film/Screen and CR Imaging - Ian A. Cunningham
Other Conferences
Vol #  Title  Editor/Conference Chair  # of papers
3031  Image Display  Yongmin Kim  87
3032  Physiology and Function from Multidimensional Images  Eric A. Hoffman  46
3033  Image Processing  Kenneth M. Hanson  123
3034  PACS Design and Evaluation: Engineering and Clinical Issues  Steven C. Horii, G. James Blaine  78
3035  Image Perception  Harold L. Kundel  36
3036  Ultrasonic Transducer Engineering  K. Kik Shung  25

1998
Medical Imaging 1998: Physics of Medical Imaging
San Diego, CA  Feb 22-24
Vol. 3336  454 papers (66 in Physics)  Attendance: 1153
Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CDRH; IS&T; NEMA; RISC; RSNA; SCAR
Chairs
James T. Dobbins III, John M. Boone
Program Committee
Larry E. Antonuk; Gary T. Barnes; Jacob Beutel; Ian A. Cunningham; Frank A. DiBianca; Robert J. Endorf; Gary S. Keyses; Hans Roesler; Robert F. Wagner; Martin J. Yaffe; Richard L. Van Metter; Herbert D. Zierman
Sessions
X-Ray Detectors I - Richard L. Van Metter
X-Ray Physics - Gary S. Keyses
Nonlinear Imaging - Robert J. Endorf
X-Ray Detectors II - Martin J. Yaffe
Mammographic Imaging - John M. Boone
Imaging Theory - Robert F. Wagner
Volume Imaging - Ian A. Cunningham
Imaging Physics - Hans Roesler
Real-Time X-Ray Detectors - Frank A. DiBianca
X-Ray Detectors III - James T. Dobbins III
Other Conferences
Vol #  Title  Editor/Conference Chair  # of papers
3335  Image Display  Yongmin Kim, Seong K. Mun  70
3337  Physiology and Function from Multidimensional Images  Eric A. Hoffman  39
3338  Image Processing  Kenneth M. Hanson  155
3339  PACS Design and Evaluation: Engineering and Clinical Issues  Steven C. Horii, G. James Blaine  65
3340  Image Perception  Harold L. Kundel  14
3341  Ultrasonic Transducer Engineering  K. Kik Shung  25

1999
Medical Imaging 1999: Physics of Medical Imaging
San Diego, CA  Feb 21-23
Vol. 3659 (In 2 vols)  499 papers (98 in Physics)  Attendance: 1123
Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CDRH; IS&T; NEMA; RISC; RSNA; SCAR
Chairs
John M. Boone, James T. Dobbins III
Program Committee
Larry E. Antonuk; Jacob Beutel; Ian A. Cunningham; Frank A. DiBianca; Robert J. Endorf; Gary S. Keyses; Hans Roesler; Robert F. Wagner; Martin J. Yaffe; Richard L. Van Metter; Herbert D. Zierman
Sessions
Direct X-Ray Detectors - Richard L. Van Metter
Imaging Theory - Robert F. Wagner
Mammography - Martin J. Yaffe
Computer Tomography - Gary S. Keyses
Ultrasound - Ian A. Cunningham
Imaging Physics - Frank A. DiBianca
Indirect X-Ray Detectors - Larry E. Antonuk
New Frontiers - Hans Roesler
Mammography II - Jacob Beutel
Thermoplastic Imaging - John M. Boone
Other Conferences
Vol #  Title  Editor/Conference Chair  papers
3658  Image Display  Seong K. Mun, Yongmin Kim  60
3660  Physiology and Function from Multidimensional Images  Chen-Tu Chen, Annes V. Clough  51
3661  Image Processing  Kenneth M. Hanson  170
3662  PACS Design and Evaluation: Engineering and Clinical Issues  G. James Blaine, Steven C. Horii  52
3663  Image Perception and Performance  Elizabeth A. Kupinski  39
3664  Ultrasonic Transducer Engineering  K. Kik Shung  28
2000

Medical Imaging 2000: Physics of Medical Imaging
San Diego, CA  Feb 13-15
Vol. 3977  493 papers (71 in Physics)  Attendance: 1082

Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CDRH; EMBS; IS&T; NEMA; RSNA; SCAR

Chairs
James T. Dobbins III, John M. Boone

Program Committee
Larry E. Antonuk; Jacob Beutel; Ian A. Cunningham; Frank A. DiBianca;
Gary S. Kayes; Andrew D. A. MacInnis; Robert A. Street; Robert F. Wagner;
Martin J. Yaffe

X-ray Detectors I - John M. Boone
Imaging Physics - Gary S. Kayes
Fluoroscopic Imaging - Robert A. Street
Mammography I - Martin J. Yaffe
Microscopy - James T. Dobbins III
Mammography II - Andrew D. A. MacInnis
Computed Tomography and MRI - Frank A. DiBianca
New Frontiers - Jacob Beutel
Volume Imaging - Ian A. Cunningham
X-ray Detectors II - Larry E. Antonuk
Optimization of Image Quality - Robert F. Wagner

Other Conferences
Vol #  Title                      Editor/Conference Chair  papers
3976  Image Display and Visualization  Seong K. Mun  62
3978  Physiology and Function from Multidimensional Images  Chin-Tu Chen, Anne V. Clough  57
3979  Image Processing  Kenneth M. Hanson  166
3980  PACS Design and Evaluation: Engineering and Clinical Issues  G. James Blaine, Elliot L. Siegel  50
3981  Image Perception and Performance  Elizabeth A. Kupinski  36
3982  Ultrasonic Imaging & Signal Process.  K. Kirk Shung, Michael F. Insana  46

2001

Medical Imaging 2001: Physics of Medical Imaging
San Diego, CA  Feb 17-23
Vol. 4320  802 papers (103 in Physics)  Attendance: 1195

Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CDRH; IS&T; NEMA; RSNA; SCAR

Chairs
Larry E. Antonuk, Martin J. Yaffe

Program Committee
Katharine P. Andriole; Tom J. Bruijns; James T. Dobbins III; Michael J. Flynn; Andrew D. A. MacInnis; Robert A. Street; Robert F. Wagner; John Yorkston

Sessions
X-ray Detectors I - Larry E. Antonuk
Imaging Physics I - Ian A. Cunningham
Fluoroscopic Imaging - Katherine P. Andriole
Mammography I - Andrew D. A. MacInnis
X-ray Detectors II - Robert A. Street
CT/MRI - Michael J. Flynn
Novel Imaging Methods I - James T. Dobbins III
Image Physics II - John Yorkston
Volume Imaging - Martin J. Yaffe
X-ray Detectors II - Robert F. Wagner

Other Conferences
Vol #  Title                      Editor/Conference Chair  papers
4319  Visualization, Display, and Image-Guided Procedures  Seong K. Mun  83
4321  Physiology and Function from Multidimensional Images  Chin-Tu Chen, Anne V. Clough  62
4322  Image Processing  Kenneth M. Hanson  166
4323  PACS and Integrated Medical Information Systems: Design and Evaluation  Elliot L. Siegel, H. K. Huang  50
4324  Image Perception and Performance  E.A. Kupinski, Dev P. Chakraborty  31
4325  Ultrasonic Imaging & Signal Processing  Michael F. Insana, K. Kirk Shung  58

2002

Medical Imaging 2002: Physics of Medical Imaging
San Diego, CA  23 - 28 February
Vol. 4802  564 papers (90 in Physics)  Attendance: 1142

Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CDRH; IS&T; NEMA; RSNA; SCAR

Chairs
Larry E. Antonuk, Martin J. Yaffe

Program Committee
Katherine P. Andriole; John M. Boone; Tom J. Bruijns; Michael J. Flynn; Paul R. Granfors; Andrew D. A. MacInnis; Robert A. Street; John Yorkston; Wei Zhao

Sessions
X-ray Detectors I - Imaging Physics
Volume Imaging I - Breast Imaging
Volume Imaging II - Novel Imaging Methods I
Fluoroscopy/Real-Time - Volume Imaging III
X-Ray Detectors II - X-Ray Detectors III - Imaging Physics II
Novel Imaging Methods II - Poster Session

Other Conferences
Vol #  Title                      Editor/Conference Chair  papers
4661  Visualization, Image-Guided Procedures, and Display  Seong K. Mun  82
4663  Physiology and Function from Multidimensional Images  Anne V. Clough, Chin-Tu Chen  53
4664  Image Processing  Milan Sonka, Michael Fitzpatrick  108
4665  PACS and Integrated Medical Information Systems: Design and Evaluation  Elliot L. Siegel, H. K. Huang  54
4666  Image Perception, Observer Performance, and Technology Assessment  Dev P. Chakraborty, Elizabeth A. Kupinski  40
4667  Ultrasonic Imaging and Signal Processing  Michael F. Insana, William F. Walker  47

2003

Medical Imaging 2003: Physics of Medical Imaging
San Diego, CA  Feb 15-20
Vol. 5630  636 papers (108 in Physics)  Attendance: 1073

Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CDRH; IS&T; NEMA; RSNA; SCAR

Chairs
Martin J. Yaffe, Larry E. Antonuk

Program Committee
Katherine P. Andriole; Harrison H. Barrett; John M. Boone; Tom J. C. Bruijns; James T. Dobbins III; Michael J. Flynn; Paul R. Granfors; John Yorkston; Wei Zhao

Sessions
Imaging Physics I - John M. Boone
X-Ray Detectors I - Larry E. Antonuk
CT - Paul R. Granfors
Breast Imaging I - Martin J. Yaffe
X-Ray Detectors II - Wei Zhao
Novel Imaging Methods - Harrison H. Barrett
Breast Imaging II - John Yorkston
Volume Imaging - US/Tomosynthesis - Michael J. Flynn
Imaging Physics II - James T. Dobbins III
X-Ray Detectors III - Tom J. C. Bruijns
Breast Imaging III - Larry E. Antonuk

Other Conferences
Vol #  Title                      Editor/Conference Chair  papers
5023  Visualization, Image-Guided Procedures, and Display  Robert L. Gafney, Jr.  86
5031  Physiology and Function: Methods, Systems, and Applications  Anne V. Clough, Arvind Anari  63
5032  Image Processing  Milan Sonka, Michael Fitzpatrick  105
5033  PACS and Integrated Medical Information Systems: Design and Evaluation  H. K. Huang, Osman M. Rafa  57
5034  Image Perception, Observer Performance, and Technology Assessment  Dev P. Chakraborty, Elizabeth A. Kupinski  59
5035  Ultrasonic Imaging & Signal Processing  William F. Walker, Michael F. Insana  56
2011

Medical Imaging 2011: Physics of Medical Imaging

Lake Buena Vista, FL  13–17 February  
Vol. 7961  864 papers (204 in Physics)  Attendance: 1136

Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CARS; IS&T MIPS; RSNA; SIIM; SMI; DICOM

Chairs
Norbert J. Pelc, Ehsan Samei, Robert M. Nishikawa

Program Committee
Guang-Hong Chen; Dianna Cody; Mats Danielsson; Maria Drangova; Thomas Flohr; Stephen J. Glick; Michael Grass; Christoph Hoeschen; Marc Kachelriess; Karim S. Karim; Hee-Joung Kim; Despina Kontos; Iacovos Kyprianou; Jinyi Qi; John A. Rowlands; John M. Sabol; Taly Gilat Schmidt; Jeffrey H. Siewerdsen; Katsuyuki Taguchi; Anders Tingberg; Bruce R. Whiting; John Yorkston;

Sessions
Keynote and Imaging and Health Economics - Norbert J. Pelc; Ehsan Samei
X-ray Imaging - John A. Rowlands; Christoph Hoeschen
Metrology - Robert M. Nishikawa; John Yorkston
Iterative and Statistical Reconstruction - Jinyi Qi; Guang-Hong Chen
Detectors I & II- John Yorkston; John A. Rowlands / Karim S. Karim; Mats Danielsson
Breast Imaging - Anders Tingberg; Stephen J. Glick
Tomosynthesis I: Reconstruction - John M. Sabol; Michael Grass
Tomosynthesis II - Despina Kontos; Anders Tingberg
X-ray Imaging: Phase Contrast Diffraction - Jeffrey H. Siewerdsen; Taly Gilat Schmidt
Image Reconstruction - Bruce R. Whiting; Katsuyuki Taguchi
CT III: Multi-energy - Thomas G. Flohr; John M. Sabol
Novel Systems - Mats Danielsson; Taly Gilat Schmidt
CT IV: Cone Beam - Maria Drangova; Marc Kachelriess
Dose - Iacovos S. Kyprianou; Hee-Joung Kim
Two Special Sessions on Dose with a Panel Discussion - Ehsan Samei; Dianna D. Cody / Christoph Hoeschen; Michael F. McNitt-Gray / Ehsan Samei

xxviii
2012

Medical Imaging 2012: Physics of Medical Imaging

San Diego, CA  Feb 5-9
Vol. 8313  909 papers (233 in Physics)  Attendance: ?

Sponsors, Co-Sponsors & Supporting Organizations
SPIE; AAPM; APS; CARS; MIPS; RSNA; SIIM; SMI; WMIS; DICOM

Chairs
Norbert J. Pelc, Robert M. Nishikawa, Bruce Whiting

Program Committee
Hilde Bosmans; Guang-Hong Chen; Dianna D Cody; Mats E Danielsson; Maria Drangova; Thomas G. Flohr; Stephen J. Glick; Michael Grass; Christoph Hoeschen; Marc Kachelriess; Karim S Karim; Hee-Joung Kim; Despina Kontos; Iacovos S. Kyprianou; Joseph Y Lo; Jinyi Qi; John A Rowlands; John M Sabol; Taly G. Schmidt; Jeffrey H. Siewerdsen; Anders Tingberg; John Yorkston

Sessions
Keynote and 3D Breast Imaging - Norbert J. Pelc; Robert M. Nishikawa
3D Breast Imaging - Hilde Bosmans; Joseph Y. Lo
Breast Multi-Energy/Photon Counting - Mats E. Danielsson; Stephen J. Glick
Mammography - Anders Tingberg; Despina Kontos
X-Ray Imaging - Hee-Joung Kim; Karim S. Karim
Small Animal Imaging - John Yorkston; Maria Drangova
Photon Counting Systems and Techniques - Taly G. Schmidt; Jeffrey H. Siewerdsen
General Radiography and Fluoroscopy - John A. Rowlands; Hee-Joung Kim
Cone Beam CT - Iacovos S. Kyprianou; John Yorkston
CT - Dianna D. Cody; Marc Kachelriess
CT Detection Performance - Jinyi Qi; Bruce R. Whiting
Dose - Christoph Hoeschen; Dianna D. Cody
Reconstruction I & II - Guang-Hong Chen; Michael Grass/ Thomas Flohr; Jeff Siewerdsen
Tomosynthesis Reconstruction - John M. Sabol; Iacovos S. Kyprianou

8314  Image Processing  David R. Haynor, Sebastien Ourselin  185
8315  Computer-Aided Diagnosis  Bram van Ginneken, Carol L. Novak  129
8316  Image-Guided Procedures, Robotic Interventions and Modeling  David R. Holmes III, Kenneth H. Wong  123
8317  Biomedical Applications in Molecular, Structural, and Functional Imaging  Robert C. Mohten, John B. Weaver  78
8318  Image Perception, Observer Performance, and Technology Assessment  Craig K. Abbey, Claudia Mello-Thoms  66
8319  Advanced PACS-based Imaging Informatics and Therapeutic Applications  William W. Boorin, Brent J. Liu  38
8320  Ultrasonic Imaging, Tomography, and Therapy  Johan G. Bosch, Marvin M. Doyley  57
**Abbreviations**

AAMI  Association for the Advancement of Medical Instrumentation  
AAPM  American Association of Physicists in Medicine  
ACR  American College of Radiology  
APS  American Physiological Society  
ARRS  American Roentgen Ray Society  
ASN  American Society of Neuroradiology  
BIOS  Biomedical Optics Society  
BRH  Bureau of Radiological Health, Department of Health, Education And Welfare  
CARS  Computer Assisted Radiology and Surgery  
CDRH  Center for Devices and Radiological Health, FDA  
DICOM  The DICOM Standards Committee  
EFOMP  European Federation of Organizations for Medical Physics  
EMBG  IEEE Engineering in Medicine and Biology Group  
EMBS  IEEE—The Institute of Electrical and Electronics Engineers/Engineering in Medicine and Biology Society  
IEEE-CS  IEEE Computer Society, Technical Committee on Computational Medicine  
IRS  Institute for Regulatory Science  
IS&T  The Society for Imaging Science and Technology  
JPL  Jet Propulsion Laboratory  
MIPS  Medical Image Perception Society  
NEMA  National Electrical Manufacturers Association/Diagnostic Imaging and Therapy, Systems Division  
OSA  The Optical Society of America  
RISC  Radiology Information System Consortium  
RSNA  Radiological Society of North America  
SCAR  Society for Computer Applications in Radiology  
SIIM  Society for Imaging Informatics in Medicine  
SMI  The Society for Molecular Imaging  
SNM  The Society of Nuclear Medicine  
SPIE  The Society of Photo-Optical Instrumentation Engineers  
SPIE-SPSE  The Society of Photographic Scientists and Engineers  
SRE  Society for Radiological Engineering  
UWMS  University of Wisconsin Medical School  
WMIS  World Molecular Imaging Society