

*Medical Imaging 2012*

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# **Advanced PACS-based Imaging Informatics and Therapeutic Applications**

**William W. Boonn**

**Brent J. Liu**

*Editors*

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# Reflections on 30 Years of PACS

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## 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 <sup>1</sup>

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 <sup>2</sup>

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 <sup>3</sup>

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 <sup>4</sup>

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. Maguire, Jr.<sup>5</sup>**

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<sup>6</sup> and Cliff Reader<sup>7</sup>**

Architectures for PACS were proposed by several authors.

### **4.2 Teleradiology – proposed by F.L. Skinner<sup>8</sup> and Will Rasmussen<sup>9</sup>**

Both authors reported on prototype systems.

### **4.3 Prototype PACS Samuel J. Dwyer III<sup>10</sup> and B.G. Thompson<sup>11</sup>**

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

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# Medical Imaging, PACS and Imaging Informatics – A Personal Perspective

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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], VIDIAN (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]

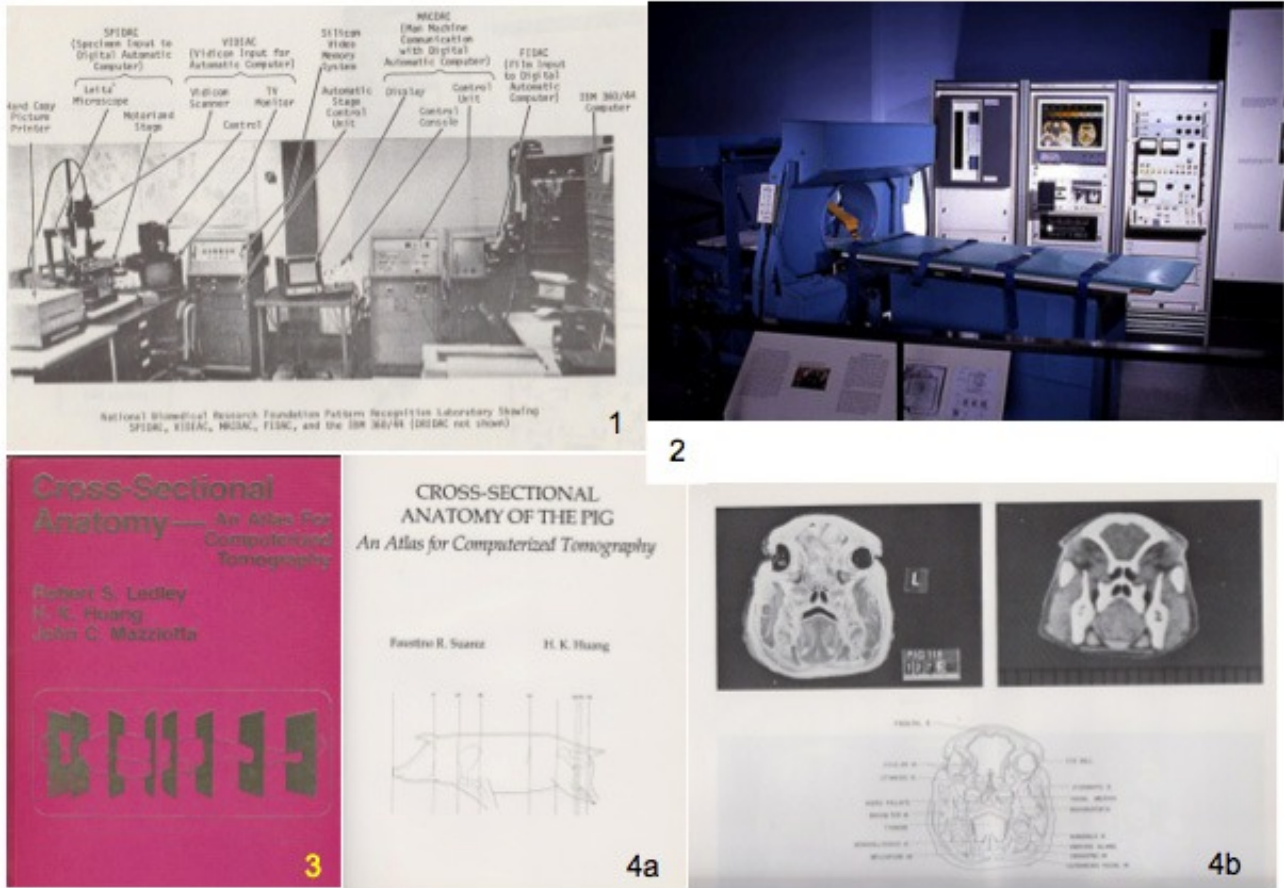
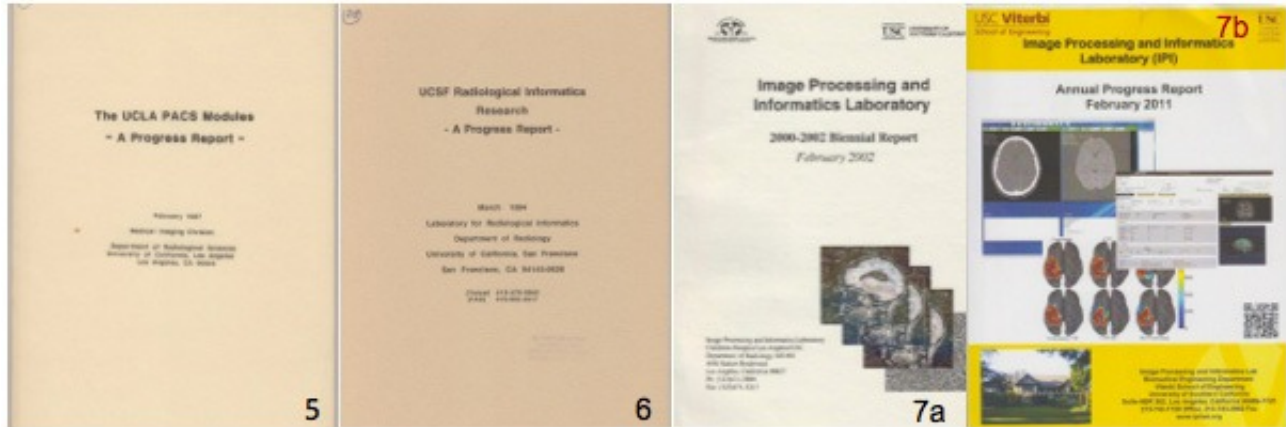


Fig 1, 2, 3, 4a, 4b: Top, Lt to Rt: Pattern Recognition Lab, at NBR, The whole body ACTA Scanner; Bottom, Lt to Mid and Rt: Cross-section Anatomy, Pig Anatomy: A frozen section, CT image, and anatomical drawing

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 health care delivery system.



Figures 5, 6, 7a, b. Left to Right: 5. UCLA (1987), 6. UCSF (1994), 7a, b USC (2000-02), USC (2010) Annual Reports

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## Fortieth Anniversary of SPIE Medical Imaging Meeting

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S. Maryland Ave. MC-2026, Chicago, IL 60637

This meeting marked the 40<sup>th</sup> 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 14<sup>th</sup> 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*

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*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.

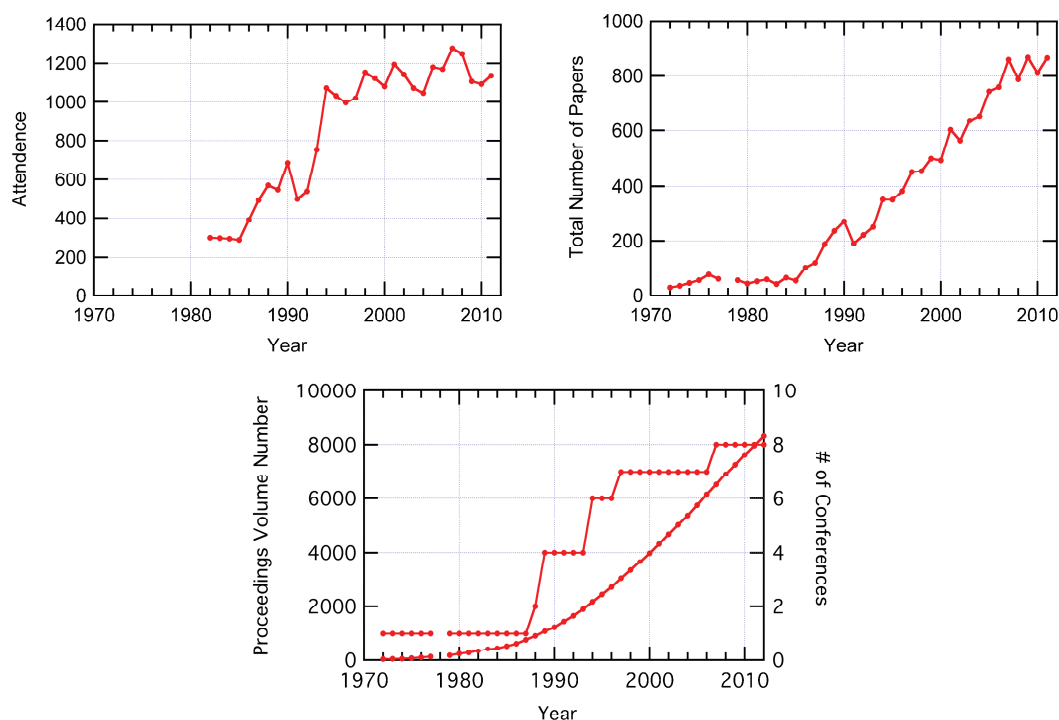


Figure 1. These plots capture some of the statistics from the meeting over time.

### 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.

Years Served as a Conference Chair		Years Served on Physics Committee	
Samuel J. Dwyer III	13	Robert F. Wagner	19
Roger H. Schneider	12	Hans Roehrig	13
R. Gilbert Jost	11	Martin J. Yaffe	12
Yongmin Kim	10	Robert J. Jennings	12
William R. Hendee	8	Harrison H. Barrett	11
Anne V. Clough	7	Arthur E. Burgess	10
Murray H. Loew	7	James T. Dobbins III	10
Joel E. Gray	6	John M. Boone	10
Kenneth M. Hanson	6	Richard L. Van Metter	10
Steven C. Horii	6	Rodney Shaw	10
Arthur G. Haus	5	Roger H. Schneider	10
Elizabeth A. Krupinski	5	John Yorkston	9
Eric A. Hoffman	5	Kunio Doi	9
Harold L. Kundel	5	Larry E. Antonuk	9
K. Kirk Shung	5	Stephen W. Smith	9
Seong K. Mun	5	Bruce R. Whiting	8
William F. Walker	5	Jacob Beutel	8
		Arthur G. Haus	7
		Ian A. Cunningham	7
		John A. Rowlands	7
		Judith M. S. Prewitt	7
		Kenneth M. Hanson	7
		Michael J. Flynn	7
		Murray H. Loew	7
		Robert A. Kruger	7
		Robert M. Nishikawa	7
		Samuel J. Dwyer III	7
		Stephen R. Thomas	7
		Steven C. Horii	7
		Thomas G. Flohr	7

## 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 29 papers Attendance: n/a

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE; BRH; ASNR; SNM; UWMS; AAPM

#### Chairs

William C. Zarnstorff, 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. Zarnstorff  
Panel Discussion - Jack S. 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; SNM; SRE; SPSE;

#### Chairs

William R. Hendee, William C. Zarnstorff, 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 - Bengt E. Bjarngard  
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. Vucich  
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 Rohrer  
Performance Evaluation of Mammographic Imaging Systems - Gregory L. Dubuque

## 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

Robert K. Cacak, Paul L. Carson, Gregory Dubuque, Joel E. Gray, Arthur G. Haus, William R. Hendee, Raymond P. Rossi

**Program Committee**  
Same as Editors

#### Sessions

Quality Assurance in Diagnostic Radiology I - Raymond P. Rossi  
Quality Assurance in Diagnostic Radiology II - Thomas Stone  
Computed Tomography I - Norman A. Baily  
Radiographic Images and Dose - Arthur G. Haus  
Computed Tomography II - Rodney A. Brooks  
Computed Tomography III - Kenneth Weaver  
Diagnostic Ultrasound I - Paul L. Carson  
Quality Assurance in Diagnostic Radiology III - Robert K. Cacak  
Current Topics in Mammography - Gregory Dubuque

## 1977

### Application of Optical Instrumentation in Medicine VI

Boston, 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, Joie Pierce Jones, Raymond Rossi

#### Sessions

The Laboratory/Clinical Interface in Image Evaluation - Robert Wagner  
Sensitometry Up-Date - Joel Gray  
Screen Film Systems and Photosensitive 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. Cacak  
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

Arthur G. Haus, William R. Hendee, Raymond P. Rossi, William Properzio

#### Sessions

Imaging Systems: Physical Evaluation - Joel Gray  
Imaging Systems: Perception Evaluation - Joel Gray  
Imaging Systems: Special Topics - 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. Mellins

## 1980

### Application of Optical Instrumentation in Medicine VIII

Las Vegas, NV Apr 20-22  
Vol. 233 43 papers Attendance: n/a

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

#### Chairs

Joel Gray, Arthur G. Haus, William R. Hendee, William S. Properzio

#### 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. Properzio  
Joint Session with the ARRS - Joel Gray; Joseph Calhoun

## 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; SPSE; AAPM; ARRS; BRH; SRE

#### Chairs

Joel E. Gray, Arthur G. Haus, William S. Properzio, James A. Mulvaney

#### Program Committee

Same as Editors

#### Sessions

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

## 1982

### Application of Optical Instrumentation in Medicine X

New Orleans May 9-12  
Vol. 347 58 papers Attendance: 300

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

#### Chairs

Gary D. Fullerton, Arthur G. Haus, William S. Properzio, James A. Mulvaney

#### Program Committee

Same as Editors

#### Sessions

Special Session on Digital Radiography - Benjamin A. Arnold; Andrew B. Crummy  
Conventional Imaging Systems Evaluation - Arthur G. Haus  
Digital Radiography - William S. Properzio  
Computed Tomography - James A. Mulvaney  
Conventional Imaging Systems Evaluation - Charles A. Kelsey  
Break-Out Session A-Digital Radiography - William S. Properzio  
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 ARRS - John Tampas; Gary D. Fullerton  
Digital Radiology (Cosponsored by The 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) - Raymond L. Nunnally  
Nuclear Magnetic Resonance (NMR) (Cosponsored by ARRS and SPIE) - A. Everette James; Raymond L. Nunnally

## 1983

### Application of Optical Instrumentation in Medicine XI

Atlanta Apr 17-20  
Vol. 419 41 papers Attendance: 298

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

#### Chairs

Gary D. Fullerton

#### Program Committee

Arthur G. Haus, James A. Mulvaney, William Properzio

#### Sessions

Advances in Breast 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. Properzio  
Digital Radiography II - Stewart C. Bushong  
Breakout Session A-Nuclear Magnetic Resonance Imaging - Gary D. Fullerton  
Breakout Session B-Digital Radiography - William S. Properzio  
Breakout Session C-Conventional Imaging - James A. Mulvaney  
Joint Session with SPIE and The ARRS - Melvin M. Figley; Gary D. Fullerton  
Nuclear Magnetic Resonance Imaging - Gary D. Fullerton  
New Modalities and Computers in Medical Imaging - Michael J. Flynn

## 1984

### Application of Optical Instrumentation in Medicine XII

San Diego, CA Feb 26-29  
Vol. 454 64 papers Attendance: 295

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE; EFOMP; JPL; CDRH; SRE

#### Chairs

Samuel J. Dwyer III, Roger H. Schneider

#### Program Committee

David G Brown; Arthur Burgess; Kunio Doi; Andre J Duerinckx; Melvin Figley;  
Kenneth M. Hanson; Steven C Horii; Robert J. Jennings; Leon Kaufman;  
James L Lehr; Murray Loew; G Poretti; Judith M S Prewitt; Stephen W Smith;  
Vincent J Sodd; Michel M Ter-Pogossian; Robert F Wagner

#### Sessions

The Physics and Statistics of Imaging I - Kenneth M. Hanson  
The Physics and Statistics of Imaging II - Arthur Burgess  
Non-ionizing imaging modalities - Robert J. Jennings  
Management of Image Data - Judith M. S. Prewitt  
Performance Analysis of X-Ray Screen-Film Systems - Robert F. Wagner  
Data Processing for Image Formation, Enhancement, & Mensuration I - James L. Lehr  
Image Display Systems I - Steven C. Horii  
Data Processing for Image Formation, Enhancement, & Mensuration II - Kunio Doi  
Data Processing for Image Formation, Enhancement, & Mensuration III - Murray Loew  
Image Display Systems II - Samuel J. Dwyer III  
Photoelectronic imaging devices - Hans Roehrig  
Data Processing for Image Formation, Enhancement, and Mensuration III - Melvin M. Figley  
Computerized Tomography and Nuclear Medicine - Roger H. Schneider

## 1985

### Application of Optical Instrumentation in Medicine XIII

Newport Beach, CA Feb 3-6  
Vol. 535 54 papers Attendance: 289

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE; CDRH; SRE; IEEE-CS

#### Chairs

Samuel J. Dwyer III, Roger H. Schneider

#### Program Committee

Roger Bauman; Stuart I Brown; Arthur Burgess; Kunio Doi; Andre J Duerinckx;  
Melvin M. Figley; Kenneth M. Hanson; Steven C. Horii; H. K. Huang; Robert J.  
Jennings; James L. Lehr; Murray Loew; Albert Macovski; Judith M. S. Prewitt;  
Rodney Shaw; Stephen W Smith; Michel M Ter-Pogossian; Robert F Wagner

#### Sessions

Image Statistics & Perception: I - Kunio Doi  
Image Statistics & Perception: II - Robert F. Wagner  
Image Statistics & Perception: III - Arthur Burgess  
Computing Images From Data - Kenneth M. Hanson  
Detector Physics I: Scatter - H. K. Huang  
Detector Physics II: Film Screen Systems - Rodney Shaw, Robert J. Jennings  
Detector Physics III: Digital - Albert Macovski  
Detector Physics IV: Semiconductors & Photoconductors - Roger Schneider  
Detector Physics V: Ultrasound & NMR - Stephen W. Smith  
Photography: Stuart I. Brown - University Hospital  
Image Processing I: General - James L. Lehr  
Image Processing II A: Task Oriented Cranial - Murray Loew  
Image Processing II B: Task Oriented-Chest - Gordon Johnson  
Image Processing II C: Task Oriented-Gastro Intestinal - Steven C. Horii

## 1986

### Application of Optical Instrumentation in Medicine XIV and Picture Archiving and Communication Systems

Newport Beach, CA Feb 2-7  
Vol. 626 101 papers Attendance: 391

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE; AAPM; CDRH

#### Chairs

Samuel J. Dwyer III, Roger H. Schneider

#### Program Committee

Laurens V Ackerman; Ronald I Arenson; Harrison H Barrett; Roger A Bauman;  
David G. Brown; Stuart I. Brown; Arthur E Burgess; Arthur Carson; Kunio Doi;  
James F. Dunn; Kenneth M. Hanson; Shankar S. Hegde; David G. Hill; Steven  
C. Horii; H. K. Huang; Robert J. Jennings; Bruce Laskin; Robert A. Kruger;  
James L Lehr; Thomas K. Lewellen; Murray H. Loew; Albert Macovski; William  
C. Mortimore; Judith M. S. Prewitt; Roland W. Redington; Stephen Riederer;  
Rodney Shaw; Stephen W. Smith; Edward Staab; Stephen R. Thomas; Henry  
N. Wagner Jr.; Robert F. Wagner; Jason S. Zielonka

#### Sessions

New Signals in Medical Imaging I & II - Roger H. Schneider & Stephen J. Riederer  
Image Formation I - IV - Kunio Doi; Robert J. Jennings; H. K. Huang; Stephen R. Thomas  
Image Perceptions - Robert F. Wagner  
Image Processing I - III - Murray H. Loew; Robert A. Kruger; Arthur E. Burgess  
Digital Image Capture and Formatting I & II - David R. Pickens & Thomas K. Lewellen  
Digital Image Display I-III - James L. Lehr; Steven C. Horii; Stephen M. Pizer  
PACS System Design and Evaluation I - V - Ronald L. Arenson; Edgar Alzner; R. Gilbert  
Jost; Roger A. Bauman; B. G. Thompson  
Archives for PACS - Judith M. S. Prewitt  
Operations Analysis and Modeling of Radiology Departments I & II - Shakar S. Hegde &  
Samuel J. Dwyer III

## 1987

### Medical Imaging

Newport Beach, CA Feb 1-6  
Vol. 767 (two volumes) 119 papers Attendance: 494

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE; AAPM; CDRH

#### Chairs

Samuel J. Dwyer III, Roger H. Schneider

#### Program Committee

Laurens V. Ackerman; Ronald L. Arenson; Harrison H. Barrett; Roger A.  
Bauman; Arthur E. Burgess; Arthur Carson; Kunio Doi; Leonard A. Ferrari;  
Kenneth M. Hanson; Shankar S. Hegde; William R. Hendee; David G. Hill;  
Steven Horii; H.K. Huang; Robert Jennings; Robert Kruger; Bruce Laskin;  
James L. Lehr; Thomas Lewellyn; Murray Lowe; William Mortimore; Laura Lee  
Murphy; Stephen M. Pizer; Judith M. S. Prewitt; Ronald R. Price; Stephen J.  
Riederer; Hans Roehrig; Rodney Shaw; Stephen W. Smith; Edward Staab;  
Stephen R Thomas; Henry N Wagner Jr; Robert F Wagner; Jason S Zielonka

#### Sessions

Future Potential of Several Candidate Signals for Medical Imaging I & II - Roger H.  
Schneider / Stephen R. Thomas  
Tomographic Reconstruction - Harrison H. Barrett  
Radiography I & II - Robert J. Jennings / Hans Roehrig  
Fluoro/Angio - Ronald R. Price  
Imaging Performance Measures - Kunio Doi  
Image Formatting and Compression - H. K. Huang  
Perception - Arthur E. Burgess  
Image Processing I-VI - Stephen J. Riederer / Rodney Shaw / David G. Hill / Robert A.  
Kruger / Yongmin Kim / Edward Staab  
Printers, Displays, and Digitizers - Roger A. Bauman  
PACS at the UCLA / PACS at Univ of Arizona - H. K. Huang / William J. Dallas  
3-D Display - James L. Lehr  
Workstations and the Display - Observer Interface I & II - Stephen Pizer / Steven C. Horii  
Networking Issues - Chris Stockbridge  
PACS I - III - Laura Lee Murphy / Samuel J. Dwyer III / Steven C. Horii

## 1988

### Medical Imaging II: Part A--Image Formation, Detection, Processing, and Interpretation

Newport Beach, CA Jan 31-Feb 5  
Vol. 914A 188 papers (102 in Physics) Attendance: 570

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE; AAPM; ACR; CDRH

#### Chairs

Samuel J. Dwyer III, Roger H. Schneider

#### Program Committee

Ronald L. Arenson; Gary T. Barnes; Harrison H. Barrett; Roger A. Bauman; Arthur Burgess; Arthur N. Carson; Jerry Cohen; Kunio Doi; Aaron Fenster; Leonard A. Ferrari; Kenneth M. Hanson; William R. Hendee; David G. Hill; Steven C. Horii; H. K. Huang; Robert J. Jennings; Robert A. Kruger; Bruce Laskin; James L. Lehr; Thomas K. Lewellyn; Murray H. Loew; William C. Mortimore; Laura Lee Murphy; Orhan Nalcioğlu; Stephen M. Pizer; Judith M.S. Prewitt; Ronald R. Price; Stephen J. Riederer; Hans Roehrig; Roger H. Shannon; Rodney Shaw; Stephen W. Smith; Edward V. Staab; Stephen R. Thomas; Robert F. Wagner; Henry N. Wagner, Jr.; Jason S. Zielonka

#### Sessions

Future Potential of the Several Candidate Signals for Medical Imaging - Roger H. Schneider  
Image Formation I - VII - Robert F. Wagner / Harrison H. Barrett / Kunio Doi / Robert A. Kruger / Aaron Fenster / Hans Roehrig / Gary T. Barnes  
Image Processing I - Arthur Burgess  
Image Processing II: Chest and Cardiological - Jerry Cohen  
Image Processing III: Cardiological - Kenneth M. Hanson  
Image Processing IV: Tomography and 3D Mapping and Interpretation - Orhan Nalcioğlu  
Image Processing: Microscopy - Judith M. S. Prewitt  
Digital Medical Photography - Roger A. Bauman

#### Other Conferences

Vol #	Title	Editor/Conference Chair	# of papers
914B	Part B--Image Data Management & Display	Samuel J. Dwyer III, Roger H. Schneider	86

## 1989

### Medical Imaging III: Image Formation

Newport Beach, CA Jan 29-31  
Vol. 1090 235 papers (51 in Physics) Attendance: 547

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE; AAPM; ACR; CDRH; IRS

#### Chairs

Samuel J. Dwyer III, R. Gilbert Jost M.D., Roger H. Schneider

#### Program Committee

Ronald L. Arenson; Harrison H. Barrett; Gary T. Barnes; Roger A. Bauman; David G. Brown; Arthur E. Burgess; Arthur Carson; Gerald Cohen; Kunio Doi; Aaron Fenster; Kenneth M. Hanson; William R. Hendee; David G. Hill; Steven C. Horii; H. K. Huang; Robert J. Jennings; Robert A. Kruger; James L. Lehr; Thomas K. Lewellyn; Murray H. Loew; Orhan Nalcioğlu; Stephen M. Pizer; Judith M. S. Prewitt; Ronald R. Price; Stephen J. Riederer; Hans Roehrig; Roger H. Shannon; Rodney Shaw; Stephen W. Smith; Edward Staab; Stephen R. Thomas; Robert F. Wagner

#### Sessions

Future Potential of the Several Candidate Signals for Medical Imaging - Roger H. Schneider  
Image Formation I - Stephen J. Riederer  
Image Formation II - Robert J. Jennings  
Image Formation III - Arthur E. Burgess  
Image Formation IV - Robert A. Kruger  
Image Formation V - Kunio Doi  
Image Formation VI - Ronald R. Price

#### Other Conferences

Vol #	Title	Editor/Conference Chair	# of papers
1091	Image Capture and Display	Samuel J. Dwyer III, R. Gilbert Jost, Roger H. Schneider	44
1092	Image Processing	Samuel J. Dwyer III, R. Gilbert Jost, Roger H. Schneider	71
1093	PACS System Design and Evaluation	Samuel J. Dwyer III, R. Gilbert Jost, Roger H. Schneider	69

## 1990

### Medical Imaging IV: Image Formation

Newport Beach, CA Feb 4-6  
Vol. 1231 270 papers (60 in Physics) Attendance: 686

**Sponsors, Co-Sponsors & Supporting Organizations**  
SPIE; AAPM; ACR; CDRH; NEMA

#### Chairs

Roger H. Schneider

#### Program Committee

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#### Sessions

Future Potential of Bioelectromagnetic and Ultrasound Imaging - Roger H. Schneider  
Future Potential of Ultrasound, CT, and Optical Imaging - Stephen W. Smith  
Future Potential of Optical Imaging - William J. Dallas  
MRI - Stephen R. Thomas  
Calculated Images - Rodney Shaw  
CT - Orhan Nalcioğlu  
Film Screen Systems - Kunio Doi  
Digital Quantum Imagers I - Hans Roehrig  
Digital Quantum Imagers II - Aaron Fenster  
Clinical Systems and Issues - Robert J. Jennings

#### Other Conferences

Vol #	Title	Editor/Conference Chair	# of papers
1232	Image Capture and Display	Yongmin Kim	43
1233	Image Processing	Murray H. Loew	54
1234	PACS Systems Design and Evaluation	Samuel J. Dwyer III, R. Gilbert Jost	113

## 1991

### Medical Imaging V: Image Physics

San Jose, CA Feb 25-26  
Vol. 1443 190 papers (26 in Physics) Attendance: 500

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#### Sessions

Magnetic Imaging - Roger H. Schneider  
Acoustic Imaging - David G. Brown  
Radiographic and Fluoroscopic Detectors and Systems - Hans Roehrig  
Decision Makers and Displays - Arthur E. Burgess  
Computing Images: CR, CT, and PET - Kenneth M. Hanson  
Cone Beam CT - Aaron Fenster  
Optical Imaging - Aaron Fenster

#### Other Conferences

Vol #	Title	Editor/Conference Chair	# of papers
1444	Image Capture, Formatting, and Display	Yongmin Kim	48
1445	Image Processing	Murray H. Loew	59
1446	PACS Design and Evaluation	R. Gilbert Jost	57

## 1992

### Medical Imaging VI: Instrumentation

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

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Lin; Richard L. Morin; Orhan Nalcioğlu; 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

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

## 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; BOS; CDRH; NEMA; IS&T; SCAR

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Richard L. Van Metter; 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 Metter

<b>Other Conferences</b>			
Vol #	Title	Editor/Conference Chair	# of papers
1897	Image Capture, Formatting, and Display	Yongmin Kim	51
1898	Image Processing	Murray H. Loew	86
1899	PACS Design and Evaluation	R. Gilbert Jost	68

## 1994

### Medical Imaging 1994: Physics of Medical Imaging

Newport Beach, CA 13-14 February  
Vol. 2163 349 papers (45 in Physics) Attendance: 1073

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Hans Roehrig; Richard L. Van Metter; 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 Metter

<b>Other Conferences</b>			
Vol #	Title	Editor/Conference Chair	# of papers
2164	Image Capture, Formatting, and Display	Yongmin Kim	55
2165	PACS: Design and Evaluation	R. Gilbert Jost	97
2166	Image Perception	Harold L. Kundel	24
2167	Image Processing	Murray H. Loew	88
2168	Physiology and Function from Multidimensional Images	Eric A. Hoffman, Raj S. Acharya	40

## 1995

### Medical Imaging 1995: Physics of Medical Imaging

San Diego, CA 26-27 February  
Vol. 2432 348 papers (60 in Physics) Attendance: 1034

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**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 Ultrasound Imaging - Randall P. Brown  
Novel Detectors for Digital Radiography I - Martin J. Yaffe  
Novel Detectors for Digital Radiography II - Frank A. DiBianca  
Novel Detectors for Digital Radiography III - Ian A. Cunningham  
Digital Radiography System Performance - Larry E. Antonuk

<b>Other Conferences</b>			
Vol #	Title	Editor/Conference Chair	# of papers
2431	Image Display	Yongmin Kim	61
2433	Physiology and Function from Multidimensional Images	Eric A. Hoffman	47
2434	Image Processing	Murray H. Loew	94
2435	PACS Design and Evaluation: Engineering and Clinical Issues	R. Gilbert Jost, Samuel J. Dwyer III	67
2436	Image Perception	Harold L. Kundel	19

## 1996

### Medical Imaging 1996: Physics of Medical Imaging

Newport Beach, CA 11-13 February  
Vol. 2708 382 papers (79 in Physics) Attendance: 996

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#### Sessions

Plenary Session - Robert Wagner  
New Concepts in Information Theory - Hans Roehrig  
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. Zeman  
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 Loew, Kenneth Hanson	102
2711	PACS Design and Evaluation: Engineering and Clinical Issues	R. Gilbert Jost, Samuel J. 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**  
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#### Sessions

Image Acquisition I - John M. Boone  
Image Acquisition II - Frank A. DiBianca  
Imaging Physics I - Robert F. Wagner  
Imaging Physics II - Hans Roehrig  
Volume Imaging I - Herbert D. Zeman  
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
3033	Physiology and Function from Multidimensional Images	Eric A. Hoffman	46
3034	Image Processing	Kenneth M. Hanson	123
3035	PACS Design and Evaluation: Engineering and Clinical Issues	Steven C. Horii, G. James Blaine	78
3036	Image Perception	Harold L. Kundel	35
3037	Ultrasonic Transducer Engineering	K. Kirk Shung	25

## 1998

### Medical Imaging 1998: Physics of Medical Imaging

San Diego, CA Feb 22-24  
Vol. 3336 454 papers (86 in Physics) Attendance: 1153

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#### Sessions

X-Ray Detectors I - Richard L. Van Metter  
X-Ray Physics - Gary S. Keyes  
Non-Ionizing 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 Roehrig  
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. Kirk Shung	25

## 1999

### Medical Imaging 1999: Physics of Medical Imaging

San Diego, CA Feb 21-23  
Vol. 3659 (in 2 vol) 499 papers (99 in Physics) Attendance: 1123

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#### Sessions

Direct X-Ray Detectors - Richard L. Van Metter  
Imaging Theory - Robert F. Wagner  
Mammography I - Martin J. Yaffe  
Computer Tomography - Gary S. Keyes  
Ultrasound - Ian A. Cunningham  
Imaging Physics - Frank A. DiBianca  
Indirect X-Ray Detectors I - Larry E. Antonuk  
New Frontiers - Hans Roehrig  
Mammography II - Jacob Beutel  
Thoracic Imaging - John M. Boone  
Indirect X-Ray Detectors II - James T. Dobbins III

#### Other Conferences

Vol #	Title	Editor/Conference Chair	papers
3658	Image Display	Seong K. Mun, Yongmin Kim	60
3660	Physiology and Function from Multidimensional Images	Chin-Tu Chen, Anne 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. Krupinski	39
3664	Ultrasonic Transducer Engineering	K. Kirk 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

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Gary S. Keyes; Andrew D. A. Maidment; Robert A. Street; Robert F. Wagner;  
Martin J. Yaffe

#### Sessions

X-ray Detectors I - John M. Boone  
Imaging Physics - Gary S. Keyes  
Fluoroscopic Imaging - Robert A. Street  
Mammography I - Martin J. Yaffe  
Microscopy - James T. Dobbins III  
Mammography II - Andrew D. A. Maidment  
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	55
3981	Image Perception and Performance	Elizabeth A. Krupinski	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 602 papers (103 in Physics) Attendance: 1195

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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. Maidment  
X-ray Detectors II - Robert A. Street  
CT/MRI - Michael J. Flynn  
Novel Imaging Methods I - James T. Dobbins III  
Imaging Physics II/Keynote - Martin J. Yaffe  
Volume Imaging - Tom J. Bruijns  
Novel Imaging Methods II - John Yorkston  
X-ray Detectors III - 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	Milan Sonka, Kenneth M. Hanson	209
4323	PACS and Integrated Medical Information Sys: Design & Evaluation	Elliot L. Siegel, H. K. Huang	56
4324	Image Perception and Performance	E.A. Krupinski, Dev P Chakraborty	31
4325	Ultrasonic Imaging & Signal Process.	Michael F. Insana, K. Kirk Shung	58

## 2002

### Medical Imaging 2002: Physics of Medical Imaging

San Diego, CA 23 - 28 February  
Vol. 4682 564 papers (90 in Physics) Attendance: 1142

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#### 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	# of paper:
4681	Visualization, Image-Guided Procedures, and Display	Seong K. Mun	82
4683	Physiology and Function from Multidimensional Images	Anne V. Clough, Chin-Tu Chen	53
4684	Image Processing	Milan Sonka, J. Michael Fitzpatrick	198
4685	PACS and Integrated Medical Information Sys: Design & Evaluation	Elliot L. Siegel, H. K. Huang	54
4686	Image Perception, Observer Performance, and Technology Assessment	Dev P. Chakraborty, Elizabeth A. Krupinski	40
4687	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. 5030 636 papers (108 in Physics) Attendance: 1073

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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
5029	Visualization, Image-Guided Procedures, and Display	Robert L. Galloway, Jr.	88
5031	Physiology and Function: Methods, Systems, and Applications	Anne V. Clough, Amir A. Amini	63
5032	Image Processing	Milan Sonka, J. Michael Fitzpatrick	205
5033	PACS and Integrated Medical Information Sys: Design & Evaluation	H. K. Huang, Osman M. Ratib	57
5034	Image Perception, Observer Performance, and Tech Assessment	Dev P. Chakraborty, Elizabeth A. Krupinski	59
5035	Ultrasonic Imaging & Signal Processing	William F. Walker, Michael F. Insana	56

## 2004

### Medical Imaging 2004: Physics of Medical Imaging

San Diego, CA 14 - 19 February  
Vol. 5368 653 papers (102 in Physics) Attendance: 1048

**Sponsors, Co-Sponsors & Supporting Organizations**  
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#### Chairs

Martin J. Yaffe, Michael J. Flynn

#### Program Committee

Harrison H. Barrett; John M. Boone; Tom J. C. Bruijns; James T. Dobbins III;  
Paul R. Granfors; John Yorkston; Wei Zhao

#### Sessions

Imaging Performance - Harrison H. Barrett  
Computer Tomography I - Tom J. C. Bruijns  
Imaging Systems Analysis I - James T. Dobbins III  
Digital Radiography I - John Yorkston  
Digital Radiography II - Paul R. Granfors  
Optical/US/Neutron Imaging - Harrison H. Barrett  
Micro Tomography - Michael J. Flynn  
Computed Tomography II - Jiang Hsieh  
Digital Radiography III - Wei Zhao  
Imaging Systems Analysis II - Michael J. Flynn  
Mammography - Martin J. Yaffe

#### Other Conferences

Vol #	Title	Editor/Conference Chair	# of paper
5367	Visualization, Image-Guided Procedures, and Display	Robert L. Galloway, Jr.	92
5369	Physiology, Function, and Structure from Medical Images	Amir A. Amini, Armando Manduca	80
5370	Image Processing	J. Michael Fitzpatrick, Milan Sonka	232
5371	PACS and Imaging Informatics	Osman M. Ratib, H. K. Huang	48
5372	Image Perception, Observer Performance, and Tech Assessment	Dev P. Chakraborty, Miguel P. Eckstein	60
5373	Ultrasonic Imaging and Signal Proc	William Walker, Stanislav Emelianov	39

## 2005

### Medical Imaging 2005: Physics of Medical Imaging

San Diego, CA 12-17 February  
Vol. 5745 745 papers (144 in Physics) Attendance: 1180

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Michael J. Flynn

#### Program Committee

Aldo Badano; Harrison H. Barrett; James T. Dobbins III; Jiang Hsieh; Bruce R. Whiting; Martin J. Yaffe; John Yorkston; Wei Zhao

#### Sessions

Keynote Session - Michael J. Flynn  
Image Data Analysis - Bruce R. Whiting  
Innovative Imaging Methods - Michael J. Flynn  
X-ray Computed Tomography - Jiang Hsieh  
X-ray Imaging Detectors - Wei Zhao  
Computational Simulations - Michael J. Flynn  
X-ray Computed Tomography - Bruce R. Whiting  
X-ray Imaging Detectors - Martin J. Yaffe  
Performance Measurement - Aldo Badano  
Digital Radiography - John Yorkston  
Tomosynthesis and Dual Energy Imaging - James T. Dobbins III

#### Other Conferences

Vol #	Title	Editor/Conference Chair	# papers
5744	Visualization, Image-Guided Procedures, and Display	Robert L. Galloway, Jr., Kevin R. Cleary	98
5746	Physiology, Function, and Structure from Medical Images	Amir A. Amini, Armando Manduca	89
5747	Image Processing	Michael Fitzpatrick, Joe Reinhardt	231
5748	PACS and Imaging Informatics	Osman M. Ratib, Steven C. Horii	63
5749	Image Perception, Observer Performance & Tech Assessment	Miguel P. Eckstein, Yulei Jiang	64
5750	Ultrasonic Imaging & Signal Process.	William Walker, Stanislav Emelianov	56

## 2006

### Medical Imaging 2006: Physics of Medical Imaging

San Diego, CA 11-16 February  
Vol. 6142 760 papers (184 in Physics) Attendance: 1169

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Michael J. Flynn, Jiang Hsieh

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#### Sessions

Keynote Session - Michael J. Flynn  
Mammography - Robert M. Nishikawa  
Tomosynthesis - Richard L. Van Metter  
X-ray CT: Cardiac - Jiang Hsieh  
Optical and MR Imaging - Harrison H. Barrett  
X-ray Imaging Detectors I & II - John A. Rowlands / Wei Zhao  
X-ray CT: Systems - Bruce R. Whiting  
Innovative Imaging - Jiang Hsieh  
X-ray Imaging - Michael Overdick  
Dual Energy X-ray Imaging - Michael J. Flynn  
Computational Simulation - Aldo Badano  
CT and DR Performance Assessment - Ehsan Samei  
Cone Beam Reconstruction - Jeffrey A. Fessler  
CT Image Reconstruction - Thomas Flohr

#### Other Conferences

Vol #	Title	Editor/Conference Chair	papers
6141	Visualization, Image-Guided Proc. & Display	Kevin Cleary, Robert Galloway, Jr.	94
6143	Physiology, Function & Struct. from Med Im	Armando Manduca, Amir A. Amini	117
6144	Image Processing	Joseph Reinhardt, Josien Pluim	243
6145	PACS and Imaging Informatics	Steven C. Horii, Osman M. Ratib	43
6146	Image Percept., Obs Perform. & Tech Assess	Yulei Jiang, Miguel P. Eckstein	44
6147	Ultrasonic Imaging and Signal Processing	Stanislav Emelianov, William Walker	35

## 2007

### Medical Imaging 2007: Physics of Medical Imaging

San Diego, CA 17-22 February  
Vol. 6510 858 papers (201 in Physics) Attendance: 1278

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#### Sessions

Dual Energy - Richard L. Van Metter  
Performance Assessment - John A. Rowlands  
Innovative Imaging I & II - Aldo Badano / Michael J. Flynn  
Detector Technology - Michael Overdick  
System Modeling - Christoph Hoeschen  
Cardiac Imaging - Jiang Hsieh  
X-ray Imaging - Ehsan Samei  
Breast Imaging - Ehsan Samei  
Tomosynthesis - Robert M. Nishikawa  
CT Systems - Bruce R. Whiting  
Signal Corrections - Thomas Flohr  
Cone Beam Reconstruction - Jeffrey A. Fessler  
Advanced Reconstruction - Katsuyuki Taguchi

#### Other Conferences

Vol #	Title	Editor/Conference Chair	
6509	Visualization and Image-Guided Procedures	Kevin R. Cleary, Michael I. Miga	115
6511	Physiology, Func. & Structure from Med. Images	Armando Manduca, Xiaoping P. Hu	87
6512	Image Processing	Josien P. W. Pluim, Joseph Reinhardt	166
6513	Ultrasonic Imaging and Signal Processing	Stan. Emelianov, Stephen McAleavey	50
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## 2008

### Medical Imaging 2008: Physics of Medical Imaging

San Diego, CA 16-21 February  
Vol. 6913 788 papers (181 in Physics) Attendance: 1250

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#### Sessions

Keynote and Small Animal Imaging - Jiang Hsieh; Ehsan Samei  
Innovative Imaging - Aldo Badano  
Optical and MR Imaging - Mats E. Danielsson  
X-ray Detectors I & II - Michael Overdick / Bruce R. Whiting  
Performance Assessment and Phantoms - Ehsan Samei  
Dual Energy - Jiang Hsieh  
Breast Tissue Modeling and Estimation - Ehsan Samei  
Breast Imaging - John A. Rowlands  
Cardiac Imaging - Christoph Hoeschen  
CT Applications - Robert M. Nishikawa  
CT System Models - Norbert J. Pelc  
Systems and Corrections - Thomas G. Flohr  
Tomographic Reconstruction - Jeffrey A. Fessler  
Algorithms and Reconstructions - Katsuyuki Taguchi

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6917	Image Perception, Obs. Performance, & Tech. Assess.	Berkman Sahiner, David J. Manning	51
6918	Visualization, Image-Guided Procedures & Modeling	Michael I. Miga, Kevin R. Cleary	106
6919	PACS and Imaging Informatics	Katherine P. Andriole, Khan M. Siddiqui	42
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## 2009

### Medical Imaging 2009: Physics of Medical Imaging

Lake Buena Vista, FL 9-12 February  
Vol. 7258 866 papers (201 in Physics) Attendance: 1107

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#### Sessions

Keynote and CT Dose: Tribute to Bruce Hasegawa - Ehsan Samei; Jiang Hsieh  
CT Performance - Ehsan Samei; Jiang Hsieh  
CT Applications - Norbert J. Pelc  
Breast CT - John A. Rowlands  
Breast Tomosynthesis - Stephen J. Glick  
Nuclear Medicine - Katsuyuki Taguchi  
Non-X-Ray Imaging - Hee-Joung Kim; Jinyi Qi  
X-Ray Detectors - John Yorkston  
Radiography and Mammography Performance - Christoph Hoeschen; John Rowlands  
Photon-Counting and Direct-Conversion Systems - Mats E. Danielsson  
Tomosynthesis - Christoph Hoeschen  
CT Algorithms - Thomas G. Flohr  
CT Corrections - Jeffrey H. Siewerdsen  
CT Hot Topics - Guang-Hong Chen  
CT Reconstruction - Bruce R. Whiting

## 2010

### Medical Imaging 2010: Physics of Medical Imaging

San Diego, CA 13-18 February  
Vol. 7622 811 papers (190 in Physics) Attendance: 1094

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#### Sessions

Keynote and Radiation Therapy Imaging - Ehsan Samei; Norbert J. Pelc  
Breast Imaging - Robert M. Nishikawa; Christoph Hoeschen  
Breast Tomosynthesis - Stephen J. Glick; Jeffrey H. Siewerdsen  
Performance Evaluation - John M. Sabol; Aldo Badano  
X-ray Phase-Contrast Imaging - Hee-Joung Kim; Norbert J. Pelc  
Novel Imaging Topics - Christoph Hoeschen; Bruce R. Whiting  
Breast Imaging - Measurement Techniques - John Yorkston; Ehsan Samei  
Selenium-based Detectors - John A. Rowlands; John Yorkston  
Photon Counting Detectors - Mats E. Danielsson; John M. Sabol  
CT Dose, Quality, and Techniques - Thomas G. Flohr; Michael Grass  
Detectors - Katsuyuki Taguchi; Stephen J. Glick  
CT Algorithms - Jinyi Qi; Guang-Hong Chen  
CT: Dual Energy and Photon-counting - Dianna D. Cody, Mats E. Danielsson  
CT Algorithms and Compressed Sensing - Guang-Hong Chen, Bruce R. Whiting  
Cone Beam CT - Jeffrey H. Siewerdsen; Michael Grass

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7628	Advanced PACS-based Imaging Informatics and Therapeutic Appl.	Brent J. Liu, William W. Boonn	36
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# 2011

## Medical Imaging 2011: Physics of Medical Imaging

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

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### 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  
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7968 Ultrasonic Imaging, Tomography, and Therapy

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# 2012

## Medical Imaging 2012: Physics of Medical Imaging

San Diego, CA Feb 5-9

Vol. 8313 909 papers (233 in Physics) Attendance: ?

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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

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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
ASNR	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
SPSE	The Society of Photographic Scientists and Engineers
SRE	Society for Radiological Engineering
UWMS	University of Wisconsin Medical School
WMIS	World Molecular Imaging Society