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Front Matter: Volume 7261

, "Front Matter: Volume 7261," Proc. SPIE 7261, Medical Imaging 2009: Visualization, Image-Guided Procedures, and Modeling, 726101 (30 March 2009); doi: 10.1117/12.829527

SPIE.

Event: SPIE Medical Imaging, 2009, Lake Buena Vista (Orlando Area), Florida, United States

Medical Imaging 2009

Visualization, Image-Guided Procedures, and Modeling

Michael I. Miga
Kenneth H. Wong
Editors

8–10 February 2009
Lake Buena Vista, Florida, United States

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SPIE

Volume 7261

Proceedings of SPIE, 1605-7422, v. 7261

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Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Medical Imaging 2009: Visualization, Image-Guided Procedures, and Modeling*, edited by Michael I. Miga, Kenneth H. Wong, Proceedings of SPIE Vol. 7261 (SPIE, Bellingham, WA, 2009) Article CID Number.

ISSN 1605-7422

ISBN 9780819475121

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

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Contents

Part One

- xvii Conference Committee
xix In Memoriam: Robert F. Wagner (1938-2008)

SESSION 1 NEURO

- 7261 02 **Fiducial registration error and target registration error are uncorrelated** [7261-01]
J. M. Fitzpatrick, Vanderbilt Univ. (United States)
- 7261 03 **Brain tumor resection guided by fluorescence imaging and MRI image guidance** [7261-02]
P. Valdes, Dartmouth College (United States); B. T. Harris, Dartmouth-Hitchcock Medical Ctr. (United States); F. Leblond, K. M. Fontaine, S. Ji, B. W. Pogue, Dartmouth College (United States); A. Hartov, Dartmouth College (United States) and Norris Cotton Cancer Ctr., Dartmouth-Hitchcock Medical Ctr. (United States); D. W. Roberts, Norris Cotton Cancer Ctr., Dartmouth-Hitchcock Medical Ctr. (United States); K. D. Paulsen, Dartmouth College (United States) and Norris Cotton Cancer Ctr., Dartmouth-Hitchcock Medical Ctr. (United States)
- 7261 04 **Automatic segmentation of cortical vessels in pre- and post-tumor resection laser range scan images** [7261-03]
S. Ding, M. I. Miga, Vanderbilt Univ. (United States); R. C. Thompson, Vanderbilt Univ. Medical Ctr. (United States); I. Garg, B. M. Dawant, Vanderbilt Univ. (United States)
- 7261 05 **Towards real-time guidewire detection and tracking in the field of neuroradiology** [7261-04]
M. Spiegel, Friedrich-Alexander Univ. Erlangen-Nuremberg (Germany) and Erlangen Graduate School in Advanced Optical Technologies (Germany); M. Pfister, Siemens AG (Germany); D. Hahn, V. Daum, Friedrich-Alexander Univ. Erlangen-Nuremberg (Germany); J. Hornegger, Friedrich-Alexander Univ. Erlangen-Nuremberg (Germany) and Erlangen Graduate School in Advanced Optical Technologies (Germany); T. Struffert, A. Dörfler, Friedrich-Alexander Univ. Erlangen-Nuremberg (Germany)
- 7261 06 **Spinal cord stress injury assessment (SCOSIA): clinical applications of mechanical modeling of the spinal cord and brainstem** [7261-05]
K. H. Wong, Georgetown Univ. (United States); J. Choi, The Catholic Univ. of America (United States); W. Wilson, Computational Biodynamics, LLC (United States); J. Berry, Computational Biodynamics, LLC (United States) and Kettering Univ. (United States); F. C. Henderson, Sr., Computational Biodynamics, LLC (United States)

SESSION 2 MINIMALLY INVASIVE I

- 7261 07 **Fusion of MDCT-based endoluminal renderings and endoscopic video** [7261-06]
L. Rai, W. E. Higgins, The Pennsylvania State Univ. (United States)

- 7261 08 **A method for accelerating bronchoscope tracking based on image registration by using GPU** [7261-07]
T. Sugiura, D. Deguchi, M. Feuerstein, Nagoya Univ. (Japan); T. Kitasaka, MEXT Innovation Ctr. for Preventive Medical Engineering, Nagoya Univ. (Japan) and Aichi Institute of Technology (Japan); Y. Suenaga, K. Mori, MEXT Innovation Ctr. for Preventive Medical Engineering, Nagoya Univ. (Japan)
- 7261 09 **Fusion of stereoscopic video and laparoscopic ultrasound for minimally invasive partial nephrectomy** [7261-08]
C. L. Cheung, Robarts Research Institute (Canada) and The Univ. of Western Ontario (United States); C. Wedlake, J. Moore, Robarts Research Institute (Canada); S. E. Pautler, The Univ. of Western Ontario (Canada) and Canadian Surgical Technologies & Advanced Robotics (Canada); A. Ahmad, Robarts Research Institute (Canada); T. M. Peters, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada)
- 7261 0A **Automatic classification of minimally invasive instruments based on endoscopic image sequences** [7261-09]
S. Speidel, J. Benzko, S. Krappe, G. Sudra, P. Azad, ITEC Univ. Karlsruhe (Germany); B. P. Müller-Stich, C. Gutt, Univ. of Heidelberg (Germany); R. Dillmann, ITEC Univ. Karlsruhe (Germany)
- 7261 0B **Absolute length measurement using manually decided stereo correspondence for endoscopy** [7261-10]
M. Sasaki, T. Koishi, T. Nakaguchi, N. Tsumura, Y. Miyake, Chiba Univ. (Japan)
- 7261 0C **Validation of CT-video registration for guiding a novel ultrathin bronchoscope to peripheral lung nodules using electromagnetic tracking** [7261-11]
T. D. Soper, D. R. Haynor, R. W. Glenn, E. J. Seibel, Univ. of Washington (United States)

SESSION 3 LIVER

- 7261 0D **Automated RFA planning for complete coverage of large tumors** [7261-12]
K. Trovato, S. Dalal, J. Krücker, Philips Research North America (United States); A. Venkatesan, B. J. Wood, National Institutes of Health (United States)
- 7261 0E **A novel technique for the three-dimensional visualization of radio-frequency ablation lesions using delayed enhancement magnetic resonance imaging** [7261-13]
B. R. Knowles, D. Caulfield, M. Ginks, St. Thomas' Hospital, King's College London (United Kingdom); M. Cooklin, J. Bostock, A. Rinaldi, J. Gill, Guy's and St Thomas' NHS Foundation Trust, St. Thomas' Hospital (United Kingdom); R. Razavi, T. Schaeffter, K. S. Rhode, St. Thomas' Hospital, King's College London (United Kingdom)
- 7261 0F **Fast registration of pre- and peri-interventional CT images for targeting support in radiofrequency ablation of hepatic tumors** [7261-14]
J. Bieberstein, C. Schumann, A. Weihusen, T. Boehler, S. Wirtz, Fraunhofer MEVIS, Institute for Medical Image Computing (Germany); P. Bruners, RWTH Aachen (Germany); D. Schmidt, Univ. Hospital Tübingen (Germany); C. Trumm, Ludwig-Maximilians-Univ. of Munich (Germany); M. Niethammer, G. Haras, Siemens Medical Solutions GmbH (Germany); R.-T. Hoffmann, Ludwig-Maximilians-Univ. of Munich (Germany); A. H. Mahnken, RWTH Aachen (Germany); P. L. Pereira, SLK-Kliniken GmbH (Germany); H.-O. Peitgen, Fraunhofer MEVIS, Institute for Medical Image Computing (Germany)

7261 OG **Matching CT and ultrasound data of the liver by landmark constrained image registration** [7261-15]

J. Olesch, N. Papenberg, Univ. of Lübeck (Germany); T. Lange, Charité Universitätsmedizin Berlin (Germany); M. Conrad, Emory Univ. (United States); B. Fischer, Univ. of Lübeck (Germany)

7261 OH **A variational method for vessels segmentation: algorithm and application to liver vessels visualization** [7261-16]

M. Freiman, L. Joskowicz, The Hebrew Univ. of Jerusalem (Israel); J. Sosna, Hadassah Hebrew Univ. Medical Ctr. (Israel)

SESSION 4 CT GUIDANCE

7261 OI **Fiducial localization in C-arm based cone-beam CT** [7261-17]

Z. Yaniv, Georgetown Univ. Medical Ctr. (United States)

7261 OJ **High-performance intraoperative cone-beam CT on a mobile C-arm: an integrated system for guidance of head and neck surgery** [7261-18]

J. H. Siewerdsen, Ontario Cancer Institute, Princess Margaret Hospital (Canada) and Univ. of Toronto (Canada); M. J. Daly, H. Chan, Ontario Cancer Institute, Princess Margaret Hospital (Canada); S. Nithiananthan, N. Hamming, K. K. Brock, Univ. of Toronto (Canada); J. C. Irish, Univ of Toronto (Canada) and Princess Margaret Hospital (Canada)

7261 OK **Automated segmentation of muscle and adipose tissue on CT images for human body composition analysis** [7261-19]

H. Chung, D. Cobzas, L. Birdsell, J. Lieffers, V. Baracos, Univ. of Alberta (Canada)

7261 OL **C-arm cone beam CT guidance of sinus and skull base surgery: quantitative surgical performance evaluation and development of a novel high-fidelity phantom** [7261-20]

A. D. Vescan, Institute of Medical Science, Univ. of Toronto (Canada); H. Chan, M. J. Daly, Ontario Cancer Institute, Princess Margaret Hospital (Canada); I. Witterick, J. C. Irish, Univ. of Toronto (Canada); J. H. Siewerdsen, Institute of Medical Science, Univ. of Toronto (Canada) and Ontario Cancer Institute, Princess Margaret Hospital (Canada)

7261 OM **Experimental comparison of landmark-based methods for 3D elastic registration of pre- and postoperative liver CT data** [7261-21]

T. Lange, Charité Universitätsmedizin Berlin, Experimental and Clinical Research Ctr. (Germany); S. Wörz, K. Rohr, Univ. of Heidelberg (Germany); P. M. Schlag, Charité Universitätsmedizin Berlin, Charité Comprehensive Cancer Ctr. (Germany)

7261 ON **Disablement of a surgical drill via CT guidance to protect vital anatomy** [7261-22]

C. C. Heath, Vanderbilt Univ. (United States); R. Balachandran, O. Majdani, Vanderbilt Univ. Medical Ctr. (United States); A. Jurik, Univ. of Virginia (United States); T. Edwards, The Univ. of North Carolina at Chapel Hill (United States); R. F. Labadie, Vanderbilt Univ. Medical Ctr. (United States); J. M. Fitzpatrick, Vanderbilt Univ. (United States)

SESSION 5 CARDIAC

- 7261 0O **In vitro cardiac catheter navigation via augmented reality surgical guidance** [7261-23]
C. A. Linte, Robarts Research Institute (Canada) and Univ. of Western Ontario (Canada);
J. Moore, Robarts Research Institute (Canada); A. Wiles, J. Lo, Robarts Research Institute
(Canada) and Univ. of Western Ontario (Canada); C. Wedlake, Robarts Research Institute
(Canada); T. M. Peters, Robarts Research Institute (Canada) and Univ. of Western Ontario
(Canada)
- 7261 0P **Computer-assisted LAD bypass grafting at the open heart** [7261-49]
C. Hartung, C. Gnahn, Univ. of Ulm (Germany); R. Friedl, Univ. Hospitals of Ulm and Lübeck
(Germany); M. Hoffmann, Univ. Hospital of Ulm (Germany); K. Dietmayer, Univ. of Ulm
(Germany)
- 7261 0Q **Echocardiography to magnetic resonance image registration for use in image-guide
electrophysiology procedures** [7261-25]
Y. Ma, K. S. Rhode, A. P. King, D. Cauldfield, King's College London (United Kingdom);
M. Cooklin, Guy's and St. Thomas' NHS Foundation Trust (United Kingdom); R. Razavi,
G. P. Penney, King's College London (United Kingdom)
- 7261 0R **Model-driven physiological assessment of the mitral valve from 4D TEE** [7261-26]
I. Voigt, Siemens Corporate Technology (Germany) and Friedrich-Alexander-Univ.
(Germany); R. I. Ionasec, Siemens Corporate Research (United States) and Technical Univ.
Munich (Germany); B. Georgescu, Siemens Corporate Research (United States); H. Houle,
Siemens Medical Solutions (United States); M. Huber, Siemens Corporate Technology
(Germany); J. Hornegger, Friedrich-Alexander-Univ. (Germany); D. Comaniciu, Siemens
Corporate Research (United States)
- 7261 0S **Curve-based 2D-3D registration of coronary vessels for image guided procedure** [7261-27]
L. Duong, R. Liao, H. Sundar, B. Tailhades, Siemens Corporate Research (United States);
A. Meyer, Siemens AG (Germany); C. Xu, Siemens Corporate Research (United States)

SESSION 6 KEYNOTE AND MODELING

- 7261 0U **Accelerated statistical shape model-based technique for tissue deformation estimation**
[7261-29]
I. Khalaji, The Univ. of Western Ontario (Canada); K. Rahemifar, Ryerson Univ. (Canada);
A. Samani, The Univ. of Western Ontario (Canada)
- 7261 0V **Effect of heterogeneous material of the lung on deformable image registration** [7261-30]
A. Al-Mayah, J. Moseley, M. Velec, K. Brock, Princess Margaret Hospital (Canada)
- 7261 0W **Using a statistical appearance model to predict the fracture load of the proximal femur**
[7261-31]
B. Schuler, K. D. Fritscher, Institute for Biomedical Image Analysis, UMIT (Austria); V. Kuhn,
Innsbruck Medical Univ. (Austria); F. Eckstein, Institute of Anatomy & Musculoskeletal, PMU
(Austria); R. Schubert, Institute for Biomedical Image Analysis, UMIT (Austria)

SESSION 7 ROBOTICS AND GUIDANCE SYSTEMS

- 7261 0X **Development and evaluation of a new image-based user interface for robot-assisted needle placements with the Robopsy system** [7261-32]
A. Seitel, German Cancer Research Ctr. (Germany); C. J. Walsh, N. C. Hanumara, Massachusetts Institute of Technology (United States); J.-A. Shepard, Massachusetts General Hospital (United States); A. H. Slocum, Massachusetts Institute of Technology (United States); H.-P. Meinzer, German Cancer Research Ctr. (Germany); R. Gupta, Massachusetts General Hospital (United States); L. Maier-Hein, German Cancer Research Ctr. (Germany)
- 7261 0Y **Human vs. robot operator error in a needle-based navigation system for percutaneous liver interventions** [7261-33]
L. Maier-Hein, German Cancer Research Ctr. (Germany); C. J. Walsh, Massachusetts Institute of Technology (United States); A. Seitel, German Cancer Research Ctr. (Germany); N. C. Hanumara, Massachusetts Institute of Technology (United States); J.-A. Shepard, Massachusetts General Hospital (United States); A. M. Franz, German Cancer Research Ctr. (Germany); F. Pianka, S. A. Müller, B. Schmied, Univ. of Heidelberg (Germany); A. H. Slocum, Massachusetts Institute of Technology (United States); R. Gupta, Massachusetts General Hospital (United States); H.-P. Meinzer, German Cancer Research Ctr. (Germany)
- 7261 0Z **Real-time video fusion using a distributed architecture in robotic surgery** [7261-34]
D. M. Kwartowitz, M. E. Rettmann, D. R. Holmes III, R. A. Robb, Mayo Clinic (United States)
- 7261 10 **Time-of-flight sensor for patient positioning** [7261-35]
C. Schaller, Friedrich-Alexander-Univ. Erlangen-Nuremberg (Germany) and International Max Planck Research School for Optics and Imaging (Germany); A. Adelt, J. Penne, Friedrich-Alexander-Univ. Erlangen-Nuremberg (Germany); J. Hornegger, Friedrich-Alexander-Univ. Erlangen-Nuremberg (Germany) and Erlangen Graduate School in Advanced Optical Technologies (Germany)
- 7261 11 **Application of an image-guided navigation system in breast cancer localization** [7261-36]
T. Alderliesten, C. Loo, A. T. E. F. Schlieff, A. Paape, M. van der Meer, K. G. A. Gilhuijs, The Netherlands Cancer Institute, Antoni van Leeuwenhoek Hospital (Netherlands)
- 7261 12 **Implant alignment in total elbow arthroplasty: conventional vs. navigated techniques** [7261-37]
C. P. McDonald, Hand and Upper Limb Ctr., St. Joseph's Health Care (Canada) and Robarts Research Institute, The Univ. of Western Ontario (Canada); J. A. Johnson, G. J. W. King, Hand and Upper Limb Ctr., St. Joseph's Health Care (Canada) and The Univ. of Western Ontario (Canada); T. M. Peters, Robarts Research Institute, The Univ. of Western Ontario (Canada)
- 7261 13 **Fast 3D vision with robust structured light coding** [7261-38]
C. Albitar, P. Graebbling, C. Doignon, Lab. des Sciences de l'Image, de l'Informatique et de la Télédétection, CNRS (France)

SESSION 8 ULTRASOUND

- 7261 14 **Fast hybrid freehand ultrasound volume reconstruction** [7261-39]
A. Karamalis, Technische Univ. München (Germany) and Siemens Corporate Research (United States); W. Wein, Siemens Corporate Research (United States); O. Kutter, N. Navab, Technische Univ. München (Germany)
- 7261 15 **Validation of four-dimensional ultrasound for targeting in minimally-invasive beating-heart surgery** [7261-40]
D. F. Pace, A. D. Wiles, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada); J. Moore, C. Wedlake, Robarts Research Institute (Canada); D. G. Gobbi, Queen's Univ. (Canada); T. M. Peters, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada)
- 7261 16 **Ultrasound goes GPU: real-time simulation using CUDA** [7261-41]
T. Reichl, CAMP, Technische Univ. München (Germany) and CSIRO, ICTC, The Australian e-Health Research Ctr., Royal Brisbane and Women's Hospital (Australia); J. Passenger, O. Acosta, O. Salvado, CSIRO, ICTC, The Australian e-Health Research Ctr., Royal Brisbane and Women's Hospital (Australia)
- 7261 17 **A GPU-based framework for simulation of medical ultrasound** [7261-42]
O. Kutter, A. Karamalis, CAMP, Technische Univ. München (Germany); W. Wein, Siemens Corporate Research (United States); N. Navab, CAMP, Technische Univ. München (Germany)
- 7261 18 **A guided wave technique for needle biopsy under ultrasound guidance** [7261-43]
F. Simonetti, Imperial College (United Kingdom)

SESSION 9 MINIMALLY INVASIVE II

- 7261 19 **A system for the registration of arthroscopic images to magnetic resonance images of the knee: for improved virtual knee arthroscopy** [7261-44]
C. Hu, G. Amati, King's College London (United Kingdom); N. Gullick, Guy's Hospital (United Kingdom) and National Institute for Health Research, Biomedical Research Ctr. (United Kingdom); S. Oakley, The Royal Newcastle Ctr. (Australia); V. Hurmusiadis, Primal Pictures Ltd. (United Kingdom); T. Schaeffter, G. Penney, K. Rhode, King's College London (United Kingdom)
- 7261 1A **Remote vs. manual catheter navigation: a comparison study of operator performance using a 2D multi-path phantom** [7261-45]
Y. Thakur, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada); C. J. Norley, Robarts Research Institute (Canada); D. W. Holdsworth, M. Drangova, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada)
- 7261 1B **New vision based navigation clue for a regular colonoscope's tip** [7261-46]
A. Mekaouar, ENIS, REsearch Group on Intelligent Machines (Tunisia) and Univ. de Lyon, INSA Lyon, Ampere (France); C. Ben Amar, ENIS, REsearch Group on Intelligent Machines (Tunisia); T. Redarce, Univ. de Lyon, INSA Lyon, Ampere (France)

- 7261 1C **Swallowable capsule with air channel for improved image-guided cancer detection in the esophagus** [7261-47]
E. J. Seibel, C. D. Melville, J. K. C. Lung, A. P. Babchanik, C. M. Lee, R. S. Johnston, Univ. of Washington (United States); J. A. Dominitz, Veterans Affairs Puget Sound Health Care System (United States)
- 7261 1D **Direct global adjustment methods for endoscopic mosaicking** [7261-48]
S. Seshamani, The Johns Hopkins Univ. (United States); M. D. Smith, J. J. Corso, M. O. Filipovich, A. Natarajan, Infinite Biomedical Technologies, LLC (United States); G. D. Hager, The Johns Hopkins Univ. (United States)
- 7261 1E **A planning system for transapical aortic valve implantation** [7261-24]
M. Gessat, Innovation Ctr. Computer Assisted Surgery (Germany); D. R. Merk, Innovation Ctr. Computer Assisted Surgery (Germany) and Heart Ctr. Leipzig (Germany); V. Falk, T. Walther, S. Jacobs, Heart Ctr. Leipzig (Germany); A. Nöttling, Siemens AG (Germany); O. Burgert, Innovation Ctr. Computer Assisted Surgery (Germany)

SESSION 10 VISUALIZATION AND GEOMETRY

- 7261 1F **Uniscale multi-view registration using double dog-leg method** [7261-50]
C.-I. Chen, Univ. of California, Santa Barbara (United States); D. Sargent, STI Medical Systems (United States); C.-M. Tsai, Y.-F. Wang, Univ. of California, Santa Barbara (United States); D. Koppel, STI Medical Systems (United States)
- 7261 1G **Optimal search guided by partial active shape model for prostate segmentation in TRUS images** [7261-51]
P. Yan, S. Xu, Philips Research North America (United States); B. Turkbey, National Institutes of Health, National Cancer Institute (United States); J. Kruecker, Philips Research North America (United States)
- 7261 1H **3D annotation and manipulation of medical anatomical structures** [7261-52]
D. Vitanovski, C. Schaller, D. Hahn, V. Daum, J. Hornegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)
- 7261 1I **nD statistical shape model building via recursive boundary subdivision** [7261-53]
S. Rueda, The Univ. of Nottingham (United Kingdom); J. K. Udupa, Univ. of Pennsylvania (United States)
- 7261 1J **A GPU-based fiber tracking framework using geometry shaders** [7261-54]
A. Köhn, J. Klein, F. Weiler, H.-O. Peitgen, Fraunhofer MEVIS, Institute for Medical Image Computing (Germany)

SESSION 11 REGISTRATION

- 7261 1K **Prostate brachytherapy seed localization using a mobile C-arm without tracking** [7261-55]
M. S. Ayad, J. Lee, J. L. Prince, Johns Hopkins Univ. (United States); G. Fichtinger, Johns Hopkins Univ. (United States) and Queen's Univ. (Canada)

- 7261 1L **Atlas-driven scan planning for high-resolution micro-SPECT data acquisition based on multi-view photographs: a pilot study** [7261-56]
M. Baiker, Leiden Univ. Medical Ctr. (Netherlands); B. Vastenhout, Univ. Medical Ctr. Utrecht (Netherlands) and MILabs. BV (Netherlands); W. Branderhorst, Univ. Medical Ctr. Utrecht (Netherlands); J. H. C. Reiber, Leiden Univ. Medical Ctr. (Netherlands); F. Beekman, Univ. Medical Ctr. Utrecht (Netherlands), Delft Univ. of Technology (Netherlands), and MILabs BV (Netherlands); B. P. F. Lelieveldt, Leiden Univ. Medical Ctr. (Netherlands) and Delft Univ. of Technology (Netherlands)
- 7261 1M **Conoscopic holography for image registration: a feasibility study** [7261-57]
R. A. Lathrop, T. T. Cheng, R. J. Webster III, Vanderbilt Univ. (United States)
- 7261 1N **Cluster of workstation based nonrigid image registration using free-form deformation** [7261-58]
X. Zheng, J. K. Udupa, X. Chen, Univ. of Pennsylvania (United States)
- 7261 1O **Group-wise registration of ultrasound to CT images of human vertebrae** [7261-59]
S. Gill, P. Mousavi, G. Fichtinger, D. Pichora, P. Abolmaesumi, Queen's Univ. (Canada)
- 7261 1P **Accuracy of non-rigid registration for local analysis of elasticity restrictions of the lungs** [7261-60]
D. Stein, R. Tetzlaff, I. Wolf, H.-P. Meinzer, German Cancer Research Ctr. (Germany)

Part Two

POSTER SESSION: CARDIAC

- 7261 1Q **Localization and tracking of aortic valve prosthesis in 2D fluoroscopic image sequences** [7261-61]
M. Karar, C. Chalopin, Innovation Ctr. Computer Assisted Surgery (Germany); D. R. Merk, Innovation Ctr. Computer Assisted Surgery (Germany) and Heart Ctr. Leipzig (Germany); S. Jacobs, T. Walther, Heart Ctr. Leipzig (Germany); O. Burgert, Innovation Ctr. Computer Assisted Surgery (Germany); V. Falk, Heart Ctr. Leipzig (Germany)
- 7261 1R **Locally homogenized and de-noised vector fields for cardiac fiber tracking in DT-MRI images** [7261-62]
A. Akhbardeh, F. Vadakkumpadan, J. Bayer, N. A. Trayanova, The Johns Hopkins Univ. (United States)
- 7261 1S **Computer-aided patch planning for treatment of complex coarctation of the aorta** [7261-63]
U. Rietdorf, German Cancer Research Ctr. (Germany); E. Riesenkampff, T. Kuehne, M. Huebler, Deutsches Herzzentrum Berlin (Germany); H.-P. Meinzer, I. Wolf, German Cancer Research Ctr. (Germany)
- 7261 1T **Left atrium pulmonary veins: segmentation and quantification for planning atrial fibrillation ablation** [7261-64]
R. Karim, Imperial College London (United Kingdom); R. Mohiaddin, Royal Brompton Hospital (United Kingdom); D. Rueckert, Imperial College London (United Kingdom)

- 7261 1U **Quantification of abdominal aortic deformation after EVAR** [7261-65]
S. Demirci, CAMP, Technische Univ. München (Germany); F. Manstad-Hulaas, St. Olavs Hospital (Norway) and Norwegian Univ. of Science and Technology (Norway); N. Navab, CAMP, Technische Univ. München (Germany)
- 7261 1V **Numerical analysis of the hemodynamic effect of plaque ulceration in the stenotic carotid artery bifurcation** [7261-66]
E. Y. Wong, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada); J. S. Milner, Robarts Research Institute (Canada); D. A. Steinman, Univ. of Toronto (Canada); T. L. Poepping, D. W. Holdsworth, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada)
- 7261 1W **Automated 3D heart segmentation by search rays for building individual conductor models** [7261-67]
J. Kim, S. Kim, Information and Communications Univ. (Korea, Republic of); K. Kim, Korea Research Institute of Standards and Science (Korea, Republic of); J. Park, Information and Communications Univ. (Korea, Republic of)
- 7261 1X **Photo-consistency registration of a 4D cardiac motion model to endoscopic video for image guidance of robotic coronary artery bypass** [7261-68]
M. Figl, Medical Univ. of Vienna (Austria); D. Rueckert, E. Edwards, Imperial College London (United Kingdom)

POSTER SESSION: CT GUIDANCE

- 7261 1Y **Preliminary experiments of a single x-ray view catheter 3D localization algorithm for targeted stem cell injections** [7261-69]
M. Iovea, ACCENT PRO 2000, Ltd. (Romania); J. Creed, Silverpoint Therapeutics, LLC (United States); E. Perin, The Texas Heart Institute (United States); M. Neagu, G. Mateiasi, ACCENT PRO 2000, Ltd. (Romania)
- 7261 1Z **Accuracy of x-ray image-based 3D localization from two C-arm views: a comparison between an ideal system and a real device** [7261-70]
A. Brost, Friedrich-Alexander-Univ. Erlangen-Nuremberg (Germany); N. Strobel, Klinik und Hochschulambulanz für Radiologie und Nuklearmedizin, Charité Universitätsmedizin Berlin (Germany); L. Yatziv, W. Gilson, Siemens Corporate Research (United States); B. Meyer, Siemens AG (Germany); J. Hornegger, Friedrich-Alexander-Univ. Erlangen-Nuremberg (Germany); J. Lewin, F. Wacker, The Johns Hopkins University School of Medicine (United States)
- 7261 20 **A method for semi-automatic segmentation and evaluation of intracranial aneurysms in bone-subtraction computed tomography angiography (BSCTA) images** [7261-71]
S. Krämer, Fern Univ. in Hagen (Germany); H. Ditt, Siemens Healthcare (Germany); C. Biermann, Siemens Healthcare (Germany) and Eberhard-Karls-Univ. of Tuebingen (Germany); M. Lell, Institute of Diagnostic Radiology, Univ. of Erlangen-Nuremberg (Germany); J. Keller, Fern Univ. in Hagen (Germany)

- 7261 21 **Tumor correlated CT: a new paradigm for motion compensated CT for image-guided therapy** [7261-72]
P. J. Parikh, K. M. Lechleiter, K. L. Malinowski, R. L. Smith, J. Wen, Washington Univ. School of Medicine in St. Louis (United States); S. Dimmer, Calypso Medical Technologies, Inc. (United States)
- 7261 22 **Comparison of pre/post-operative CT image volumes to preoperative digitization of partial hepatectomies: a feasibility study in surgical validation** [7261-73]
P. Dumpuri, Vanderbilt Univ. (United States); L. W. Clements, Pathfinder Therapeutics, Inc. (United States); R. Li, Vanderbilt Univ. (United States); J. M. Waite, J. D. Stefansic, Pathfinder Therapeutics, Inc. (United States); D. A. Geller, Univ. of Pittsburgh Medical Ctr., Liver Cancer Ctr. (United States); M. I. Miga, B. M. Dawant, Vanderbilt Univ. (United States)
- 7261 23 **Evaluating optimal CNR as a preset criteria for nonlinear modal blending of dual energy CT data** [7261-74]
D. R. Holmes III, Mayo Clinic (United States); A. Apel, Siemens Healthcare (Germany); J. G. Fletcher, L. S. Guimaraes, Mayo Clinic (United States); C. E. Eusemann, Siemens Healthcare (Germany); R. A. Robb, Mayo Clinic (United States)

POSTER SESSION: MODELING

- 7261 24 **Determining material properties of the breast for image-guided surgery** [7261-75]
T. J. Carter, C. Tanner, D. J. Hawkes, Ctr. for Medical Image Computing, Univ. College London (United Kingdom)
- 7261 25 **Recognition of surgical skills using hidden Markov models** [7261-76]
S. Speidel, T. Zentek, G. Sudra, ITEC Univ. Karlsruhe (Germany); T. Gehrig, B. P. Müller-Stich, C. Gutt, Univ. of Heidelberg (Germany); R. Dillmann, ITEC Univ. Karlsruhe (Germany)
- 7261 26 **3D finite element model for treatment of cleft lip** [7261-77]
C. Jiao, D. Hong, H. Lu, J. Wang, Q. Lin, Fourth Military Medical Univ. (China); Z. Liang, State Univ. of New York at Stony Brook (United States)
- 7261 27 **Deformable hollow organ models with self-collision processing between inner surfaces** [7261-78]
K. Nishimura, T. Koishi, T. Nakaguchi, S. Morita, N. Tsumura, Y. Miyake, Chiba Univ. (Japan)
- 7261 28 **Accuracy of localization of prostate lesions using manual palpation and ultrasound elastography** [7261-79]
C. Kut, Johns Hopkins Univ. School of Medicine (United States); C. Schneider, The Johns Hopkins Univ. (United States); N. Carter-Monroe, Johns Hopkins Univ. School of Medicine (United States); L.-M. Su, Univ. of Florida College of Medicine (United States); E. Boctor, Johns Hopkins Univ. School of Medicine (United States); R. Taylor, The Johns Hopkins Univ. (United States)
- 7261 29 **Curvature and shape variance based landmark tagging methods for building statistical object models** [7261-80]
S. Rueda, The Univ. of Nottingham (United Kingdom); J. K. Udupa, Medical Imaging Processing Group, Univ. of Pennsylvania (United States); L. Bai, The Univ. of Nottingham (United Kingdom)

- 7261 2C **Investigating an approach to identifying the biomechanical differences between intercostal cartilage in subjects with pectus excavatum and normals in vivo: preliminary assessment of normal subjects** [7261-83]
K. Rechowicz, F. McKenzie, Z. Yan, S. Bawab, S. Ringleb, Old Dominion Univ. (United States)
- 7261 2D **3D reconstruction of the human spine from radiograph(s) using a multi-body statistical model** [7261-84]
J. Boisvert, Queen's Univ. (Canada); F. Cheriet, Ecole Polytechnique de Montréal (Canada); X. Pennec, N. Ayache, INRIA Sophia Antipolis (France)
- 7261 2E **Model-based brain shift compensation in image-guided neurosurgery** [7261-85]
S. Ji, F. Liu, X. Fan, Dartmouth College (United States); A. Hartov, Dartmouth College (United States) and Norris Cotton Cancer Ctr. (United States); D. Roberts, Norris Cotton Cancer Ctr. (United States) and Dartmouth-Hitchcock Medical Ctr. (United States); K. Paulsen, Dartmouth College (United States) and Norris Cotton Cancer Ctr. (United States)
- 7261 2F **A PDE approach for quantifying and visualizing tumor progression and regression** [7261-86]
B. J. Sintay, J. D. Bourland, Wake Forest Univ. School of Medicine (United States)
- 7261 2G **Constrained hyperelastic parameters reconstruction of PVA (Polyvinyl Alcohol) phantom undergoing large deformation** [7261-87]
H. Mehrabian, The Univ. of Western Ontario (Canada); A. Samani, The Univ. of Western Ontario (Canada) and Robarts Research Institute (Canada)

POSTER SESSION: GUIDANCE AND TECHNOLOGY

- 7261 2H **Collision-free 6D non-holonomic planning for nested cannulas** [7261-88]
K. Trovato, A. Popovic, Philips Research North America (United States)
- 7261 2I **Ultrasound elastography: enabling technology for image guided laparoscopic prostatectomy** [7261-89]
I. N. Fleming, H. Rivaz, The Johns Hopkins Univ. (United States); K. Macura, Johns Hopkins Medical Institutions (United States); L.-M. Su, Univ. of Florida College of Medicine (United States); U. Hamper, G. A. Lagoda, A. L. Burnett II, T. Lotan, Johns Hopkins Medical Institutions (United States); R. H. Taylor, G. D. Hager, The Johns Hopkins Univ. (United States); E. M. Boctor, Johns Hopkins Medical Institutions (United States)
- 7261 2J **Improved navigation for image-guided bronchoscopy** [7261-90]
R. Khare, The Pennsylvania State Univ. (United States); K.-C. Yu, Endographics Imaging Systems, Inc. (United States); W. E. Higgins, The Pennsylvania State Univ. (United States)
- 7261 2K **Direct endoscopic video registration for sinus surgery** [7261-91]
D. Mirota, R. H. Taylor, The Johns Hopkins Univ. (United States); M. Ishii, Johns Hopkins Bayview Medical Ctr. (United States); G. D. Hager, The Johns Hopkins Univ. (United States)
- 7261 2L **Using a wireless motion controller for 3D medical image catheter interactions** [7261-92]
D. Vitanovski, D. Hahn, V. Daum, J. Hornegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

- 7261 2M **Post-operative assessment in Deep Brain Stimulation based on multimodal images: registration workflow and validation** [7261-93]
F. Lalys, INSERM (France), INRIA (France), and Univ. of Rennes I, CNRS, IRISA (France); C. Haegelen, INSERM (France), INRIA (France), Univ. of Rennes I, CNRS, IRISA (France), and Pontchaillou Univ. Hospital (France); A. Abadie, P. Jannin, INSERM (France), INRIA (France), and Univ. of Rennes I, CNRS, IRISA (France)
- 7261 2N **Optimal landmarks selection and fiducial marker placement for minimal target registration error in image-guided neurosurgery** [7261-94]
R. R. Shamir, L. Joskowicz, The Hebrew Univ. of Jerusalem (Israel); Y. Shoshan, Hadassah Univ. Hospital (Israel)
- 7261 2O **Fusion of intraoperative cortical images with preoperative models for neurosurgical planning and guidance** [7261-96]
A. Wang, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada); S. M. Mirsattari, A. G. Parrent, London Health Sciences Ctr. (Canada); T. M. Peters, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada)
- 7261 2Q **Transbronchial needle aspiration with a new electromagnetically-tracked TBNA needle** [7261-98]
J. Choi, Catholic Univ. of America (United States); T. Popa, Imaging Science and Information Systems Ctr., Georgetown Univ. Medical Ctr. (United States); L. Gruionu, Univ. of Craiova (Romania)
- 7261 2R **A dual compute resource strategy for computational model-assisted therapeutic interventions** [7261-99]
D. Hackworth, P. Dumpuri, M. I. Miga, Vanderbilt Univ. (United States)
- 7261 2S **An open-source framework for testing tracking devices using Lego Mindstorms** [7261-100]
J. Jomier, L. Ibanez, A. Enquobahrie, Kitware, Inc. (United States); D. Pace, Robarts Research Institute (Canada); K. Cleary, Georgetown Univ. (United States)
- 7261 2T **An improved method for compensating ultra-tiny electromagnetic tracker utilizing position and orientation information and its application to a flexible neuroendoscopic surgery navigation system** [7261-101]
Z. Jiang, Nagoya Univ. (Japan); K. Mori, Mext Innovative Research Ctr. for Preventive Medical Engineering, Nagoya Univ. (Japan); Y. Nimura, M. Feuerstein, Nagoya Univ. (Japan); T. Kitasaka, Mext Innovative Research Ctr. for Preventive Medical Engineering, Nagoya Univ. (Japan) and Aichi Institute of Technology (Japan); Y. Suenaga, Mext Innovative Research Ctr. for Preventive Medical Engineering, Nagoya Univ. (Japan); Y. Hayashi, E. Ito, M. Fujii, T. Nagatani, Y. Kajita, T. Wakabayashi, Nagoya Univ. (Japan); J. Yoshida, Higashi Nagoya National Hospital (Japan)
- 7261 2U **Evaluation of dynamic electromagnetic tracking deviation** [7261-103]
J. Hummel, Wilhelminenspital (Austria) and Medical Univ. of Vienna (Austria); M. Figl, Medical Univ. of Vienna (Austria); M. Bax, R. Shahidi, Stanford Univ. School of Medicine (United States); H. Bergmann, W. Birkfellner, Medical Univ. of Vienna (Austria)
- 7261 2V **Elasticity-based three dimensional ultrasound real-time volume rendering** [7261-104]
E. M. Boctor, M. Matinfar, O. Ahmad, H. Rivaz, M. Choti, R. H. Taylor, Johns Hopkins Medical Institutions (United States)

POSTER SESSION: VISUALIZATION AND GEOMETRY

- 7261 2X **Reliability of vascular geometry factors derived from clinical MRA** [7261-105]
P. B. Bijari, Institute of Biomaterials and Biomedical Engineering and Biomedical Simulation Lab., Univ. of Toronto (Canada); L. Antiga, Mario Negri Institute for Pharmacological Research (Italy); D. A. Steinman, Institute of Biomaterials and Biomedical Engineering and Biomedical Simulation Lab., Univ. of Toronto (Canada)
- 7261 2Y **Visualization of multiresolution model for volumetric medical data by using weighted alpha shapes** [7261-106]
K. Lee, Handong Global Univ. (Korea, Republic of)
- 7261 2Z **Interactive vessel-tracking with a hybrid model-based and graph-based approach** [7261-107]
D. Fritz, Siemens Healthcare Sector (Germany); T. Beck, Siemens Healthcare Sector (Germany) and Univ. of Karlsruhe (Germany); M. Scheuering, Siemens Healthcare Sector (Germany)
- 7261 30 **A visualization system for CT based pulmonary fissure analysis** [7261-108]
J. Pu, B. Zheng, S. C. Park, Univ. of Pittsburgh (United States)
- 7261 31 **Quantitative and visual analysis of white matter integrity using diffusion tensor imaging** [7261-109]
X. Liang, Q. Zhuang, N. Cao, J. Zhang, Lab. for Computational Medical Imaging & Data Analysis, Univ. of Kentucky (United States)
- 7261 32 **Evaluation of topology correction methods for the generation of the cortical surface** [7261-110]
W. Li, V. A. Magnotta, The Univ. of Iowa (United States)
- 7261 33 **Analysis and dynamic 3D visualization of cerebral blood flow combining 3D and 4D MR image sequences (Honorable Mention Poster Award)** [7261-111]
N. D. Forkert, D. Säring, J. Fiehler, T. Illies, Univ. Medical Ctr. Hamburg-Eppendorf (Germany); D. Möller, Univ. Hamburg (Germany); H. Handels, Univ. Medical Ctr. Hamburg-Eppendorf (Germany)
- 7261 34 **Visualization of risk structures for interactive planning of image guided radiofrequency ablation of liver tumors** [7261-112]
C. Rieder, M. Schwier, A. Weihusen, S. Zidowitz, H.-O. Peitgen, Fraunhofer MEVIS, Institute for Medical Image Computing (Germany)

POSTER SESSION: REGISTRATION

- 7261 35 **A contrast and registration template for magnetic resonance image data guided dental implant placement** [7261-113]
G. Eggers, R. Cosgarea, M. Rieker, Heidelberg Univ. (Germany); B. Kress, Krankenhaus Nordwest (Germany); H. Dickhaus, J. Mühling, Heidelberg Univ. (Germany)
- 7261 36 **Feature-driven deformation for dense correspondence** [7261-114]
D. Ghosh, A. Sharf, N. Amenta, Univ. of California, Davis (United States)

- 7261 37 **Reduction of multi-fragment fractures of the distal radius using atlas-based 2D/3D registration** [7261-115]
R. H. Gong, J. Stewart, P. Abolmaesumi, Queen's Univ. (Canada)
- 7261 38 **Surface-based determination of the pelvic coordinate system** [7261-116]
L. Fieten, J. Eschweiler, S. Heger, Helmholtz Institute for Biomedical Engineering, RWTH Aachen Univ. (Germany); K. Kabir, S. Gravius, Univ. Hospital Bonn (Germany); M. de la Fuente, K. Radermacher, Helmholtz Institute for Biomedical Engineering, RWTH Aachen Univ. (Germany)
- 7261 39 **Intraoperative localization of brachytherapy implants using intensity-based registration (Honorable Mention Poster Award)** [7261-117]
Z. KarimAghaloo, P. Abolmaesumi, N. Ahmadi, T. K. Chen, D. G. Gobbi, G. Fichtinger, Queen's Univ. (Canada)
- 7261 3A **A deformation model for non-rigid registration of the kidney** [7261-118]
R. E. Ong, C. L. Glisson, S. D. Herrell, M. I. Miga, R. Galloway, Vanderbilt Univ. (United States)
- 7261 3B **Real-time estimation of FLE for point-based registration** [7261-119]
A. D. Wiles, T. M. Peters, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada)
- 7261 3C **Computer-aided method for automated selection of optimal imaging plane for measurement of total cerebral blood flow by MRI** [7261-120]
P. Teng, A. M. Bagci, N. Alperin, Univ. of Illinois at Chicago (United States)
- 7261 3D **Iterative solution for rigid-body point-based registration with anisotropic weighting** [7261-121]
R. Balachandran, Vanderbilt Univ. Medical Ctr. (United States); J. M. Fitzpatrick, Vanderbilt Univ. (United States)

Author Index

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 Pierre Jannin, INSERM/Université de Rennes I (France)
- 2 Minimally Invasive I
 William E. Higgins, The Pennsylvania State University (United States)

- 3 Liver
Robert L. Galloway, Jr., Vanderbilt University (United States)
Gabor Fichtinger, The Johns Hopkins University (United States)
- 4 CT Guidance
Baowei Fei, Emory University School of Medicine (United States)
Kevin R. Cleary, Georgetown University Medical Center (United States)
- 5 Cardiac
Guy Shechter, Philips Research (United States)
Terry M. Peters, Robarts Research Institute (Canada)
- 6 Keynote and Modeling
Michael I. Miga, Vanderbilt University (United States)
Kenneth H. Wong, Georgetown University (United States)
- 7 Robotics and Guidance Systems
David R. Holmes III, Mayo Clinic (United States)
Frank Sauer, Siemens Corporate Research (United States)
- 8 Ultrasound
Frank Sauer, Siemens Corporate Research (United States)
David R. Haynor, University of Washington (United States)
- 9 Minimally Invasive II
Yeong Gil Shin, Seoul National University (Korea, Republic of)
Ziv R. Yaniv, Georgetown University (United States)
- 10 Visualization and Geometry
Jayaram K. Udupa, University of Pennsylvania (United States)
George J. Grevera, St. Joseph's University (United States)
- 11 Registration
Ivo Wolf, Deutsches Krebsforschungszentrum (Germany)
Jay B. West, Accuray, Inc. (United States)

In Memoriam
Robert F. Wagner
1938–2008

**A founding scientist and prolific contributor
to modern medical imaging science and SPIE**

Robert F. "Bob" Wagner was a tremendous innovator in the field of medical imaging and image assessment methodologies. He was a key figure in the creation of the SPIE Medical Imaging symposium. An SPIE Fellow since 1988, Bob was active on the program committee of the Physics of Medical Imaging conference at the Medical Imaging symposium, and author of numerous technical papers published by SPIE.

"The medical imaging community has lost one of its founding fathers and most highly regarded members," said Kyle Myers, director of the Division of Imaging and Applied Mathematics at the Center for Devices and Radiological Health (CDRH), U.S. Food and Drug Administration (FDA). "Bob's career was dedicated to the development of consensus measurement methods for the assessment of medical imaging systems, quantitative medical imaging and tissue characterization, and computer-aided diagnosis. He earned an international reputation in these areas and applied his expertise to a wide range of regulatory issues central to the FDA's mission. He enlightened the scientific community within the agency as well as the international scientific community through the many invited presentations and tutorials he gave in and outside of the FDA, his numerous publications, his many professional society activities, and his assistance in regulatory decision making."

At this 2009 Medical Imaging symposium, a joint keynote session hosted by the CAD and Image Perception conferences honored Bob's many contributions from the early 1970s to the present through a series of presentations by some of his closest collaborators.

David Brown (CDRH/FDA) recalled Bob's early years in the field, relating that after graduate and post-graduate work on the physics of nuclear interactions with radiation, Bob was hired by the Bureau of Radiological Health [a precursor to CDRH] to assess the dose reduction potential of radiographic intensifying screens made with phosphors developed in the color TV industry. Within three months he published a review of the relevant imaging literature from the medical, defense, consumer, and scientific communities, together with a charter for a laboratory program. Soon after, Bob introduced digital noise analysis to radiography, and showed that the new technology offered a 1.6- to 2.5-fold exposure reduction without compromising imaging performance. He then launched a program of inter-laboratory comparison of measurements on radiographic film samples that were circulated among fifteen commercial, government, and academic laboratories worldwide. In the process he became the prime mover for work toward consensus methodology for quantitative imaging performance measurements.

Mike Insana (Univ. of Illinois at Urbana-Champaign) shared memories of his years as Bob's post-doctoral student, working with Bob on the statistical characterization of ultrasound images. He described Bob as an exemplary mentor who shared his passion and joy for science.

Myers agreed, "Bob's greatest legacy may be the many young scientists he nurtured, who either worked directly under his tutelage at the FDA or otherwise benefitted from his unfailing patience and unselfish ease of availability."

Harry Barrett (Univ. of Arizona) began his presentation by relating noise-equivalent quanta (NEQ)—a concept central to Bob's unified approach to objective image performance assessment—to historical information-theoretic methods for evaluation of imaging systems. Barrett went on to describe the many ways in which NEQ was extended to address problems beyond the simple signal-known-exactly, background-known-exactly (SEK/BKE) task.

Ken Hanson (Los Alamos National Lab.) described his years of collaboration with Bob. He said they worked together, first in the area of noise characterization of radiographic and CT images and later on the evaluation of images confounded by artifacts. In this latter work, Bob and Ken pioneered the application of a decision theoretic approach to the assessment of image reconstruction algorithms, demonstrating that the common mean-square-error metric did not predict visual task performance as measured by detectability.

Bob's contemporary work, as described by Myers, "involved the consideration of the random effects associated with multiple readers of medical images and the logical extension of this work to the problem of the evaluation of multiple competing classifiers in statistical pattern recognition. Bob tackled problems of increasing complexity over the course of his career, relying throughout on the application of a unified, decision theoretic framework. In the process he brought about consensus on the importance of a task-based approach to the objective assessment of imaging systems."

During more than forty years of professional life, Bob Wagner made numerous contributions to the field of medical imaging that significantly impacted academia, industry, and the FDA. His brilliant mind, incredible intuition, passion for science, sense of humor, charm, and warm friendship will be greatly missed.