Airport Passenger Screening: Backscatter X-Ray Machines

Committee

Harry E. Martz, Jr.

Chair

Harry E. Martz, Jr. is the director of the nondestructive characterization center at Lawrence Livermore National Laboratories (LLNL). He received a B.S. degree in 1979 from Siena College and an M.S. and Ph.D. in 1986 from Florida State University. For six years, he led the computed tomography project at LLNL, applying computed tomography and x-ray and proton radiography to material characterization and gamma-ray gauge techniques to treaty verification activities. As Center Director his projects included the use of nonintrusive x-ray and gamma-ray computed tomography techniques as three-dimensional imaging tools to understand material properties and analyze radioactive waste forms. He has applied these techniques to the inspection of automobile and aircraft parts, reactor fuel tubes, high explosives, and shape charges. Recent research includes use of x-rays to find explosives in luggage and special nuclear materials in cargo containers. The research and development in his Center includes the design and construction of scanners and preprocessing, image reconstruction, and analysis algorithms. Dr. Martz has previously been a member of the National Research Council Committee on Commercial Aviation Security and the Panel on Airport Passenger Screening.

Barbara J. McNeil

Vice Chair

Barbara J. McNeil, is the Ridley Watts Professor and was appointed the founding head of the Department of Health Care Policy at Harvard Medical School in 1988. She is also a Professor of Radiology at Harvard Medical School and at Brigham and Women's Hospital. She continues to practice nuclear medicine one day a week at BWH. She was interim dean of Harvard Medical School in summer, 2007. Dr. McNeil received her A.B. degree from Emmanuel College, her M.D. degree from Harvard Medical School, and her Ph.D. degree from Harvard University. She is a member of the Institute of Medicine of the National Academy of Sciences and the American Academy of Arts and Sciences. Dr. McNeil is also a member of the Blue Cross Technology Evaluation Commission; she formerly chaired the Medicare Evidence Development Coverage Advisory Committee (MedCAC), and she is now a member of that committee. She is currently a member of the NRSB and its vice chair. She serves as an advisor for several other federal and private organizations. Dr. McNeil formerly served on the Publications Committee of the New England Journal of Medicine as well as on the Prospective Payment Assessment Commission. Dr. McNeil's early career involved research in decision analysis and cost-effective analysis. More recently, her work has focused on quality of care and technology assessment. Her research involves relationships with payers, providers and the federal government. Her largest ongoing study compares quality of care in the VA system with that in the private setting for patients with cancer. For several years she coordinated several large studies comparing the value of alternative imaging modalities for patients with cancer.

Sally A. Amundson

Member

Sally A. Amundson, is an associate professor of radiation oncology in the Center for Radiological Research at the Columbia University Medical Center in New York. Her research uses functional genomics approaches to study low dose radiation and bystander effects, unique effects of space radiation, and the development of gene expression approaches for radiation biodosimetry. She is co-director of the Center for High-Throughput Minimally-Invasive Radiation Biodosimetry. She has served on the National Council for Radiation Protection and Measurements (NCRP) since 2004, and is currently co-chairing an NCRP committee tasked with producing a commentary on a "Multiplatform national approach for providing guidance on integrating basic science and epidemiological studies on low-dose radiation biological and health effects." Since 2009, Dr. Amundson has served on the Science Advisory Committee of the Radiation Effects Research Foundation (RERF) in Hiroshima, chairing the RERF scientific review for 2012. She is also an associate editor of Radiation Research, a member of the Radiation Research Society (RRS) Council, and a recipient of the Michael Fry Research Award from the RRS.

David E. Aspnes

Member

David E. Aspnes, is a Distinguished University Professor and member of the Department of Physics at North Carolina State University. Formal education includes BS (1960) and MS (1961) degrees in electrical engineering from the University of Wisconsin–Madison and a Ph.D. (1965) in physics from the University of Illinois at Urbana-Champaign. He joined the North Carolina State University Physics Department in 1992 as a full professor and was made a Distinguished University Professor in 1999. He was elected as a member of the National Academy of Sciences in 1998. Principal research interests have been in the areas of optical spectroscopy and semiconductor and surface physics. Contributions include the discovery, elucidation, and development of low-field electroreflectance for high-resolution spectroscopy of semiconductors and the determination of their band structures; the development and application of spectroscopic ellipsometry to surfaces, interfaces, thin films, and bulk materials; and the development and application of reflectance-difference spectroscopy to real-time analysis of epitaxial growth. Current research activities are directed toward nondestructive analysis of surfaces and interfaces, and in particular the real-time diagnostics and control of semiconductor epitaxy by organometallic chemical vapor deposition. Dr. Aspnes has published over 400 papers and has been granted 23 patents.

Arnold Barnett

Member

Arnold Barnett, is George Eastman Professor of Management Science and Professor of Statistics at MIT’s Sloan School of Management. He holds a BA in Physics from Columbia University and a PhD in Mathematics from MIT. Dr. Barnett’s research specialty is applied statistical analysis generally focused on problems of health and safety. Aviation safety is among his prime areas of application: he was described as “the nation’s leading expert” on aviation safety by NBC News, and he received the President’s Citation in 2002 from the Flight Safety Foundation for “truly outstanding contributions on behalf of safety.” He has worked for 16 airlines, six airports, the Federal Aviation Administration, and the Transportation Security Administration. Dr. Barnett has received the President’s Award for “outstanding contributions to the betterment of society” by the Institute for Operations Research and the Management Sciences (INFORMS); he also received the 2001 Expository Writing Award from INFORMS and is a Fellow of that organization. A popular instructor, he has been honored 12 times for outstanding teaching at MIT.

Thomas B. Borak

Member

Thomas B. Borak, is a professor in the Department of Environmental and Radiological Health Sciences at Colorado State University. He received a BS in physics from St. John's University (Minnesota) and a PhD in physics from Vanderbilt University. His research interests are in radiation physics and dosimetry which currently includes: "Early Stage Innovations for the NASA Office of Space Technology Research and The Impacts of Dose Received from External Radiation and Risk Perception on Psychological Sequelae in Ukrainians following the Chornobyl Accident," which is funded by the NSF. He has had scientific staff appointments at Fermilab, CERN, and Argonne National Laboratory. He has been a consultant to the Governor of Colorado concerning issues relating to low-level radioactive waste management and nuclear criticality safety. Dr. Borak was a member of the National Academy of Sciences Committees on Risk Assessment of Exposure to Radon in Drinking Water (1999) and Assessment of the Scientific Information for the Radiation Exposure Screening and Education Program (2005). He is a Distinguished Emeritus member of the National Council on Radiation Protection and Measurements (NCRP) and recently served on the Radiation Advisory Committee for the Science Advisory Board of the EPA. Dr. Borak is certified by the American Board of Health Physics.

Leslie A. Braby

Member

Leslie A. Braby, is a research professor and senior lecturer in nuclear engineering at Texas A&M University. He received his B.A. in physics from Linfield College and Ph.D. in radiological physics from Oregon State University. He joined General Electric, later Pacific Northwest National Laboratory, at Hanford, Washington, initially conducting research on detectors and instruments for measuring absorbed dose. Motivated by the need to understand the biological effectiveness of different radiations, he proceeded to study the interaction of ionizing radiation with biological material and the resulting changes in biological systems. One aspect of this is the study of the probability density of energy deposition in cell nuclei and other small volumes, now known as microdosimetry. His experience in microdosimetry research led him to develop the tissue equivalent proportional counter systems currently used for radiation dosimetry on the international space station. In order to study the biological changes that occur at low doses he developed the first single particle microbeam irradiation system, as well as other specialized irradiation equipment, and continues to work with biologists to study dose and dose rate effects as well as the bystander effect. He moved to Texas A&M in 1996, and continues his research in radiation dosimetry while teaching radiation physics, dosimetry, and microdosimetry at the graduate level. He has served on a number of National Council on Radiation Protection and International Commission on Radiation Units and Measurements committees dealing with dosimetry, microdosimetry, and radiation safety in space. He chaired NCRP committees leading to Commentaries 17 and 20 dealing with radiation protection issues associated with neutron and high energy x ray based cargo scanning systems. He also chaired the ICRU committee which developed Report 86 which recommends use of charged particle fluence rather than absorbed dose to quantify heterogeneous exposures such as those resulting from low dose or microbeam irradiation.

Mats P. Heimdahl

Member

Mats P.E. Heimdahl, is the director of the University of Minnesota Software Engineering Center at University of Minnesota. Dr. Heimdahl’s research interests are in software engineering, safety critical systems, software safety, testing, requirements engineering, formal specification languages, and automated analysis of specifications. He is also currently pursuing the following areas: static analysis of system and software requirements, for example, through model checking and theorem proving; how dynamic methods, for example, simulation and testing, can be used to validate requirements specifications; model based software development; automated test case generation; and software certification.

Sandra L. Hyland

Member

Sandra L. Hyland, is a Senior Principal Engineer at BAE systems. Dr. Hyland has 25 years experience in program management in both for- and non-profit organizations. She is currently a senior semiconductor engineer at BAE systems. Prior to that, she served in various positions at Tokyo Electron. She has also served as a staff officer at the National Research Council’s National Materials Advisory Board and an advisory engineer at IBM. Dr. Hyland has a Ph.D. in materials science and engineering from Cornell University, an M.S. in electrical engineering from Rutgers University, and a B.S. in electrical engineering from Rensselaer Polytechnic Institute. Dr. Hyland is a member of the American Vacuum Society, Electrochemical Society and the Institute of Electrical and Electronic Engineers. She is a fellow of the Society of Women Engineers, and previously served as chair of the National Research Council Committee on Engineering Aviation Security Environments - False Positives from Explosive Detection Systems.

Sheldon H. Jacobson

Member

Sheldon H. Jacobson is a Professor and Director of the Simulation and Optimization Laboratory in the Department of Computer Science at the University of Illinois. Professor Jacobson works in the field of Operations Research, a discipline that embodies the application of analytical tools to analyze and understand complex and complicated systems. His methodological research addresses problems related to Stochastic sequential assignment when there is uncertainty in the model inputs, and the design of novel exact algorithms for hard discrete optimization problems based on the cross fertilization of traditional search methods like branch and bound with memory. His areas of application include aviation security system design and analysis (optimal allocation and use of security assets, and understanding the impact of new technologies on security system performance), problems within the general area of public health (pediatric vaccine formulary design and pricing, pediatric vaccine stockpiling, the relationship between obesity and transportation, and the impact of cell phone use on automobile accident rates). The author of over 200 journal research articles, book chapters, conference proceeding papers, and professional and editorial papers, Professor Jacobson has been recognized with several national and international awards, including the Award for Technical Innovation in Industrial Engineering from the Institute of Industrial Engineers and a Guggenheim Fellowship from the John Simon Guggenheim Memorial Foundation.

Jay Loeffler

Member

Jay S. Loeffler, is the chair of radiation oncology, Massachusetts General Hospital, Boston and the Herman and Joan Suit Professor, department of radiation oncology, Harvard Medical School. Dr. Loeffler is an honors graduate of Williams College and Brown University School of Medicine. He completed his radiology/oncology training at the Harvard Joint Center for Radiation Therapy and a year of post-doctorial fellowship at Harvard School of Public Health Radiobiology Laboratory. He was recruited to the MGH in 1996 as Director of the NE Proton Therapy Center. He is an authority on the treatment of benign and malignant brain tumors. He is an author of over 200 peer reviewed publications, 180 book chapters and review articles and co-editor of 9 textbooks. He has served as PI on a large program project grant from the NCI concerning proton therapy. He serves on the Editorial Boards of eight journals.

C. Kumar N. Patel

Member

C. Kumar N. Patel, is the founder, president, and chief executive officer of Pranalytica, Inc., a Santa Monica based company that is the leader in quantum cascade laser technology for defense and homeland security applications. He is also professor of physics and astronomy, electrical engineering, and chemistry at the University of California, Los Angeles (UCLA). He served as vice chancellor for research at UCLA from 1993-1999. Prior to joining UCLA, he was the executive director of the Research, Materials Science, Engineering and Academic Affairs Division at AT&T Bell Laboratories, where he began his career by carrying out research in the field of gas lasers. He is the inventor of the carbon dioxide and many other molecular gas lasers that ushered in the era of high-power sources of coherent optical radiation. Dr. Patel was awarded the National Medal of Science for his invention of the carbon dioxide laser. His other awards include the Ballantine Medal of the Franklin Institute, the Zworykin Award of the National Academy of Engineering, the Lamme Medal of the Institute of Electronic and Electrical Engineers, the Texas Instruments Foundation Founders Prize, and many more. Dr. Patel holds a B.E. in telecommunications from the College of Engineering in Poona, India, and received his M.S. and Ph.D. in electrical engineering from Stanford University. He is a member of the National Academy of Sciences and the National Academy of Engineering. He received his Ph.D. in electrical engineering from Stanford.

Mauro Sardela

Member

Mauro Sardela, is a Senior Research Scientist at the Frederick Seitz Materials Research Laboratory at University of Illinois at Urbana-Champaign. Dr. Sardela has a Ph.D. in materials science and since 1998 is the manager of the x-ray analytical facilities at the Frederick Seitz Materials Research Laboratory at the University of Illinois at Urbana. He is author of many highly-regarded scientific publications in the fields of materials science and chemistry with focus on novel electronic materials. In addition to his research, Dr. Sardela is responsible for the training and supervision of scientists from various institutions that use the facilities at the University of Illinois. He has been involved in the installation, testing and development of several commercial x-ray analytical instruments. Dr. Sardela has hands-on experience in several aspects of safety, calibration and maintenance of advanced x-ray tools. He works closely with several vendors of x-ray instruments in development of new optics, systems and metrology in the field. Previously to his current position, Dr. Sardela worked in the semiconductor industry in the California Bay area. As a Senior Research Scientist at the University of Illinois, Dr. Sardela also holds two positions regarding safety policies and supervision. He is currently a co-chair of the Safety Committee at the Materials Research Laboratory in charge of overseeing and determining safety policies of all scientific work in the entire department involving x-rays and laser radiation in addition to chemical and biological materials. Dr. Sardela has also been nominated by the Vice-Chancellor of Research as a member of the University of Illinois Radiation Safety Committee which is the most prominent entity at the University in charge of overseeing safety procedures and regulations in the entire campus involving x-rays, lasers and radiological materials.

Zhi-Min Yuan

Member

Zhi-Min Yuan, is professor of radiation biology and director of John B. Little Center, at Harvard School of Public Health. He received his medical degree from the Jiangxi Medical College in China and his Ph.D. in biomedical chemistry from the University of Maryland. Afterward, he served at different scientific positions at Harvard School of Public Health. Dr. Yan’s research is funded primarily by the Department of Energy and the National Institutes of Health and focuses on elucidation of signaling mechanisms that regulate cellular stress in response to radiation and other stimuli and on examining how stress signals affect cell behaviors in the context of cancer. One of his current studies involves investigating the mechanisms underlying low dose radiation-induced adaptive response.