Triennial Review of the National Nanotechnology Initiative

Committee

Celia I. Merzbacher

Chair

is the Vice President of Innovative Partnerships at Semiconductor Research Corporation. Dr. Merzbacher is primarily responsible for developing novel partnerships with stakeholders in government and the private sector in support of SRC's research and education goals. Prior to joining SRC, Dr. Merzbacher was Assistant Director for Technology R&D in the White House Office of Science and Technology Policy (OSTP), where she coordinated and advised on a range of issues, including nanotechnology, technology transfer, technical standards, and intellectual property. At OSTP she oversaw the National Nanotechnology Initiative, the multiagency federal program for nanotechnology research and development. She also served as executive director of the President's Council of Advisors on Science and Technology, which is composed of leaders from academia, industry, and other research organizations, and advises the president on technology, scientific research priorities, and math and science education. Previously, Dr. Merzbacher was on the staff of the Naval Research Laboratory (NRL) in Washington D.C. As a research scientist at NRL, she developed advanced optical materials, for which she received a number of patents. She also worked in the NRL Technology Transfer Office where she was responsible for managing NRL intellectual property. Dr. Merzbacher served on the board of directors of the American National Standards Institute and led the U.S. delegation to the Organization for Economic Cooperation and Development Working Party on Nanotechnology. Dr. Merzbacher received her B.S. in geology from Brown University and M.S. and Ph.D. in geochemistry and mineralogy from the Pennsylvania State University.

James S. Murday

Vice Chair

is the Director of Physical Sciences at the University of Southern California's (USC) Washington, D.C., Office of Research Advancement. He received a B.S. in physics from Case Institute of Technology in 1964 and a Ph.D. in solid state physics from Cornell in 1970. Prior to joining USC's Office of Research Advancement Office in the fall of 2006, he was at the Naval Research Laboratory (NRL) where he served as bench scientist from 1970 - 1974, led the Surface Chemistry effort from 1975-1987, and was superintendent of the Chemistry Division from 1988 to 2006 when he retired from federal service. Additional responsibilities include: from May to August 1997 he served as Acting Director of Research for the Department of Defense, Research, and Engineering; from January 2003 to July 2004, he served as Chief Scientist, Office of Naval Research; from January 2001 to April 2003 he served as Director of the National Nanotechnology Coordination Office; and from January 2001 to November 2006 he served as Executive Secretary of the U.S. National Science and Technology Council's Subcommittee on Nanometer Science Engineering and Technology (NSET). He is a member of the American Physical Society, the American Chemical Society, and the Materials Research Society; and he is a fellow of the American Vacuum Society's (AVS) Science and Technology Society and the United Kingdom's Institute of Physics. His research interests in nanoscience began in 1983 as an Office of Naval Research program officer and continued through his work at the NRL Nanoscience Institute. Under his direction, both the AVS and the International Union for Vacuum Science, Technology and Applications created a Nanometer Science/Technology Division.

Robert H. Austin

Member

is a professor of physics at Princeton University. He received his B.A. in physics from Hope College in Holland, MI, and his Ph.D. in physics from the University of Illinois at Champaign-Urbana in 1976. He held a post-doctoral position at the Max Planck Institute for Biophysical Chemistry from 1976-1979 and has been at Princeton University in the department of physics from 1979 to the present, achieving the rank of Professor of Physics in 1989. He is a Fellow of the American Physical Society, a fellow of the American Association for the Advancement of Science, and a member of the U.S. National Academy of Sciences. He has served as a President of the Division of Biological Physics of the American Physical Society, and is the present chair of the U.S. Liaison Committee of the International Union of Pure and Applied Physics. He has served as the biological physics editor for Physical Review Letters, serves on numerous review panels for NIH, NSF, the Burroughs Welcome Fund, and NIST, and is the editor of the Virtual Journal of Biological Physics. He won the 2005 Edgar Lilienfeld Prize of the American Physical Society.

Anita Goel

Member

is the chairman and CEO at Nanobiosym. Dr. Anita Goel is a world-renowned expert and pioneer in the emerging field of nanobiophysics - a new science at the convergence of physics, nanotechnology, and biomedicine. Dr. Goel was named by MIT's Technology Review Magazine as one of the world's "Top 35 Science and Technology Innovators." Her pioneering contributions to nanotechnology and nanobiophysics have been recognized globally by prestigious honors and awards including multiple awards from U.S. government agencies such as DARPA, DOD, DOE, AFOSR, NSF, USAID, and HHS. Dr. Goel holds a Ph.D. and M.A. in physics from Harvard University, an M.D. from the Harvard-MIT Joint Division of Health Sciences and Technology (HST) at Harvard Medical School and a B.S. in physics with honors and distinction from Stanford University. As chairman and CEO of Nanobiosym and Nanobiosym Diagnostics, Dr. Goel has harnessed these fundamental insights to invent, incubate, and start commercializing next-generation nanotechnology platforms like Gene-RADAR® for mobile and personalized health, energy harvesting and quantum computing with molecular nanomachines that read and write information in DNA. She served on the Committee on Manufacturing, Design, and Innovation of the National Academy of Engineering (NAE) to look at the future of manufacturing in the U.S. Dr. Goel also serves on the Canadian Institute for Advanced Research (CIFAR) research council to advise their president on the development of advanced research roadmaps for Canada Dr. Goel is a fellow of the World Technology Network, a fellow-at-large of the Santa Fe Institute, an adjunct professor at the Beyond Institute for Fundamental Concepts in physics, and an associate of the Harvard Physics Department. She also serves on the Nanotechnology Advisory Board of Lockheed Martin Corporation and the Scientific Advisory Board of Pepsico. Dr. Goel was recently awarded the XPRIZE by in the 2013 Nokia Sensing XCHALLENGE.

Douglas W. Jamison

Member

is the chairman and chief executive officer at Harris & Harris Group, Inc., a publicly traded venture capital company listed on the Nasdaq Global Market (NASDAQ: TINY). Harris & Harris Group builds transformative companies enabled by disruptive science. He has previously held the positions of president, chief operating officer, and chief financial officer of Harris & Harris Group, Inc. He is also currently chairman and chief executive officer of H&H Ventures Management, Inc., a wholly owned subsidiary of Harris & Harris Group. He is chairman of the board of Directors of HZO, Inc., and ProMuc, Inc., as well as a member of the Board of Directors of Produced Water Absorbents, Inc., and a Board observer in ABS Materials, Inc., and Metabolon, Inc., privately held portfolio companies of Harris & Harris Group. He was responsible for Harris & Harris Group's investment in Solazyme, Inc. (Nasdaq: SZYM) prior to it going public in May 2011. He was also a member of the Board of Directors of Innovalight, Inc., prior to its acquisition by E.I. du Pont de Nemours and Company. He is co-editor-in-chief of "Nanotechnology Law & Business." He was a member of the University of Pennsylvania Nano-Bio Interface Ethics Advisory Board. Prior to joining Harris & Harris Group, he was a Senior Technology Manager at the University of Utah Technology Transfer Office, where he managed intellectual property in physics, chemistry and the engineering sciences. He is a graduate of Dartmouth College (B.A., 1992) and the University of Utah (M.S., 1999).

Gerhard Klimeck

Member

is the director of the Network for Computational Nanotechnology and the Reilly Director of the Center for Predictive Materials and Devices and Professor of Electrical and Computer Engineering at Purdue University. He is a fellow of the Institute of Physics (IOP), a fellow of the American Physical Society (APS), a fellow of IEEE, and member of HKN and TBP. He guides the technical developments and strategies of nanoHUB.org, which annually serves over 320,000 users worldwide with on-line simulation, tutorials, and seminars. Professor Klimeck's research interests are in the modeling of nanoelectronic devices, parallel cluster computing, and genetic algorithms. He headed the development of the Nanoelectronic Modeling Tool—NEMO5. Dr. Klimeck was the Technical Group Supervisor of the High Performance Computing Group and a Principal Scientist at the NASA Jet Propulsion Laboratory, California Institute of Technology. Previously he was a member of technical staff at the Central Research Lab of Texas Instruments where he served as manager and principal architect of the Nanoelectronic Modeling (NEMO 1-D) program. At JPL and Purdue Gerhard developed the Nanoelectronic Modeling tool (NEMO 3-D) for multimillion atom simulations. Dr. Klimeck received his Ph.D. in 1994 on Quantum Transport from Purdue University and his German electrical engineering degree in experimental studies of laser noise propagation in 1990 from Ruhr-University Bochum. Dr. Klimeck's work is documented in over 220 peer reviewed journal and 180 proceedings publications and over 220 invited and 410 contributed conference presentations. His h-index is 37 on the Web of Science and 47 on Google Scholar.

Martin A. Philbert

Member

is a professor of toxicology and dean at University of Michigan. He became dean of the University of Michigan School of Public Health on January 1, 2011, having previously served as senior associate dean for research at the school since 2004. He arrived at UM in 1995 from Rutgers' Neurotoxicology Laboratories, where he was a research assistant professor. He has maintained a continuously federally funded portfolio of basic research activities throughout his career. Most recently his work has been funded by the National Institutes of Health, the Department of Air Force and the National Cancer Institute. At the national level, he is recognized for his expertise in neurotoxicology and experimental neuropathology. He is the author of numerous research publications in top pee-reviewed journals, and one book. Active research activities include experimental neuropathology, nitrocompound-induced encephalopathies, mitochondrial mechanisms in non-neuronal cell death, development of Nano-Optical Chemical Systems for in vivo physiology, and nanostructure-based imaging and treatment of tumors of malignant gliomas.

Nelly M. Rodriguez

Member

is the president of Catalytic Materials LLC. She has a Ph.D. from University of Newcastle upon Tyne. As an associate professor of chemistry at Northeastern University she co-founded Catalytic Materials in 1995 and became the president in 2001. Her early career included a position as Assistant Professor at Universidad Industrial de Santander, Bucaramanga, Colombia. Part of her early industrial career includes a position as internal researcher at Airco Carbon and researcher at the corporate research laboratories of Exxon Research & Engineering Co. Additional international experience was gained at Hokkaido University in Sapporo, Japan, during 1986. During her time at the Pennsylvania State University in the materials research laboratory, she spent 1992-94 as an assistant professor of Materials and Research and 1994-96 as an associate professor. She has 110 publications; 28 patents; and one book edited. During her whole career key research areas have always included aspects of carbon nanotechnology, heterogeneous catalysis, work with in-situ transmission electron microscopy of materials and nano-particles, as well as controlled atmosphere studies of carbon gasification by atomic oxygen and catalyzed carbon deposition processes.

Bridget R. Rogers

Member

is associate professor of chemical and biomolecular engineering at Vanderbilt University. She obtained her Ph.D. and M.S. degrees from Arizona State University in 1998 and 1990, respectively and a B.S. degree from the University of Colorado, Boulder, in 1984. Dr. Rogers completed her M.S. and Ph.D. work while holding a full-time engineering position with Motorola. From 1984 through 1998 she was an engineer in Motorola’s Semiconductor Products Division, starting as a rotational engineer and rising to the level of technical staff scientist. Through her years at Motorola, she held positions from Manufacturing Process Engineer in the areas of photolithography and etch, Process Development Engineer in plasma and RIE etching, and Technical Staff Scientist in materials characterization and development. Her specialty was electron spectroscopies and her last project at Motorola was diffusion barrier development for copper metallization. Dr. Rogers joined Vanderbilt as an assistant professor in the Chemical Engineering Department in 1998. Her research has focused on the relationships of processing, properties, and performance of technically important materials. In 2001 she was awarded an NSF Career Award for development of alumina/zirconia alloys for high-k gate dielectrics. She was awarded a PECASE (Presidential Early Career Award for Scientist and Engineers) by the DoD for “contributions to fundamental studies of thin film growth mechanisms, and for being the first to prove experimentally that the composition of multi-component films deposited into microelectronic device features varied with depth into the feature.” Dr. Rogers was a key contributor to the development of the cleanroom facilities for the Vanderbilt Institute of Nanoscale Science and Engineering. Dr. Rogers is a fellow of the American Vacuum Society (AVS). Her recent activities with the AVS have been focused on nanomanufacturing. She led the Nanomanufacturing Focus Topic at the 2011-2013 AVS International Symposia and is currently the chair of the AVS Manufacturing Science and Technology Group. Dr. Rogers has also served on proposal review panels for the NSF Nanomanufacturing program.

Lourdes Salamanca-Riba

Member

is a professor at the University of Maryland. Her research is in the areas of self-assembly of semiconductor nanowires and liquid crystal nanocomposites for hybrid photovoltaic applications, DNA-based biosensors and radiation sensors on GaAs, and materials with high C content in the form of nanocarbon called “covetics”. Dr. Salamanca-Riba’s research involves the use of transmission electron microscopes and the atomic force microscope at the Nanoscale Imaging, Spectroscopy, and Properties (NISP) Laboratory. Her project on covetics involves the understanding of the role of nanocarbon on the structure and properties of metals. The incorporation of carbon enhances several properties of the host metal, such as its thermal and electrical conductivity, oxidation and corrosion resistance, and yield strength. Her project on DNA attached to GaAs aims at understanding the anchoring mechanism between thiolated DNA and GaAs that gives rise to arrays of single stranded DNA molecules oriented normal to the surface of GaAs. These structures could be used for the fabrication of biosensors and radiation sensors. Her third project is in the growth and characterization of semiconductor nanowire arrays of ZnO for the fabrication of light emitting devices. The nanowires are combined with liquid crystals for applications as hybrid photovoltaics in which the liquid crystal is the hole conductor and the ZnO the electron conductor. These solar cells are expected to have higher efficiencies than organic solar cells and to be less expensive to produce than inorganic solar cells.

Brent M. Segal

Member

is the Director of Advanced Research Programs at Lockheed Martin. He is also chief technologist for Lockheed Martin Nanosystems, following the acquisition of the Nantero Government Business in 2008. In his role at Lockheed Martin, Brent has a broad charter to integrate nanotechnology throughout the Lockheed Martin product portfolio. In addition Brent is active in the Healthcare, Energy and Cleantech spaces, acting as a technology scout to bring small companies and university projects to Lockheed Martin. He assists with government program management for projects involving sensors, nanoelectronics, and materials science with DOD, DOE, and other customers. Dr. Segal received a B.S. in biochemistry from Reed College and a Ph.D. in chemistry from Harvard University. Prior to joining Lockheed Martin, he co-founded and served as the chief operating officer of Nantero, a leading Nanotechnology company where he generated more than 100 patents and applications. Nantero raised $31.5 million in three private equity rounds (DFJ, CRV and Globespan) and secured government programs totaling in excess of $50 million Dr. Segal’s interest in energy issues has led him to explore deals involving reduction of global CO2 levels through the use of renewable energy sources such as biofuels, photovoltaics, wind power, and fuel cells.

Subhash C. Singhal

Member

is a Battelle Fellow Emeritus at Pacific Northwest National Laboratory (PNNL). He joined the Energy and Environment Directorate at PNNL in April 2000 after having worked at Siemens Power Generation (formerly Westinghouse Electric Corporation) for over 29 years. At PNNL, Dr. Singhal provides senior technical, managerial, and commercialization leadership to the laboratory's extensive fuel cell and clean energy programs. At Siemens/Westinghouse, he conducted and/or managed major research, development, and demonstration programs in the field of advanced materials for various energy conversion systems including steam and gas turbines, coal gasification, and fuel cells. He has authored over 85 scientific publications, edited 14 books, received 13 patents, and given almost 300 plenary, keynote, and other invited presentations worldwide. Dr. Singhal is also an Adjunct professor in the Department of Materials Science and Engineering at the University of Utah and a visiting professor at the China University of Mining and Technology-Beijing. He serves on the advisory boards of the Department of Materials Science and Engineering at the University of Florida, Florida Institute for Sustainable Energy, Division of Materials Science and Engineering at Boston University, and the Center on Nanostructuring for Efficient Energy Conversion at Stanford University. Dr. Singhal is a member of the U.S. National Academy of Engineering and the Washington State Academy of Sciences. He has also served on many national and international advisory panels including those of the National Materials Advisory Board of the National Research Council, National Science Foundation, Materials Properties Council, U.S. Department of Energy, NATO Advanced Study Institutes and NATO Science for Peace Programs, United Nations Development Program (UNDP), United Nations Industrial Development Organization (UNIDO), International Energy Agency (IEA), and the European Commission.

Rhonda Stroud

Member

is the head of the Nanoscale Materials Section at the U.S. Naval Research Laboratory (NRL). In her current position she oversees the DoD’s most advanced electron microscope facility for nanoscale materials characterization. She is an expert in the application of transmission electron microscopy to advancing nanoscale materials development through establishing structure-composition-properties-relationships, including understanding the lifecycle of nanoscale materials in space environments. Her research interests span many classes of materials, from quasicrystals and oxide electronics to aerogel nanocomposites and nanoparticles formed in supernovae. She received her B.A. in physics from Cornell University in 1991, and her Ph.D. in physics from Washington University in St. Louis in 1996. After two years as an NRL-NRC postdoctoral fellow, she became an NRL Research Physicist in 1998, and was promoted to Section Head in 2007. Her publications include over 250 journal articles and conference proceedings, with over 5000 citations and an h-index of 39. She holds five patents. She has served as an external reviewer for the Materials Division at Argonne National Laboratory, and on DOE’s external review committee for the electron microscopy user facilities at Oak Ridge National Lab and the National Center for Electron Microscopy at Lawrence Berkley National Lab. She was a Director of the Microanalysis Society of America (2011-2013), and now serves as the MAS Strategic Planning Chair (2015-2018). She has received many awards for her work, including election to fellowship in the American Physical Society, and the Meteoritical Society, the NRL Sigma Xi Young Investigator Award, and the naming of an asteroid in her honor by the International Astronomical Union.

Michael S. Tomczyk

Member

is the Innovator in Residence at Villanova University, where he is engaged in a variety of innovation activities through the Center for Innovation, Creativity, and Entrepreneurship (ICE) in Villanova's School of Business. He joined Villanova after retiring from the Wharton School at the University of Pennsylvania (1995-2014), where he served as managing director of the Emerging Technologies Management Research Program, the Mack Center for Technological Innovation, and the Mack Institute for Innovation Management. Mr. Tomczyk is an authority on radical/disruptive innovation and an avid innovation champion dedicated to helping to develop, guide and promote emerging technologies and applications. He is a frequent speaker on innovation topics at insight-building workshops and conferences for industry, academic, and government organizations. His research and writing currently focuses on innovations in nanotechnology. Mr. Tomczyk is the author of NanoInnovation: What Every Manager Needs to Know (Wiley, Dec. 2014). As part of his research for this book he interviewed more than 150 leaders in nanotechnology science/engineering and business. He is a senior member of the IEEE/IEC committee developing standards for the use of nanotechnology in electronics and a founding strategic advisor of the Nanotechnology Research Foundation. He has also contributed thought leadership in bioscience/medical innovation. For 10 years he served on the translational medicine committee at the Perelman School of Medicine, University of Pennsylvania. His numerous publications include a book chapter entitled Applying the Marketing Mix (5 P's) to Bionanotechnology in Biomedical Nanotechnology (Springer 2011); and a co-authored research report entitled The Future of BioSciences: Four Scenarios for 2020 and Their Implications for Human Healthcare (Wharton, 2006). During his career he has been involved in a wide range of high tech innovations, as a corporate executive and business consultant. As a technology pioneer, he is best known for managing the development and launch of the first full-featured home computer (the Commodore VIC-20, 1980) which was the first microcomputer to sell one million units. His Commodore experiences are described in his 1984 book, The Home Computer Wars. He earned an M.A. in environmental studies from the University of Pennsylvania, an M.B.A. from the University of California, Los Angeles (UCLA) and a B.A.from the University of Wisconsin-Oshkosh.