FELLOWS OF THE U.S. ARMY RESEARCH LABORATORY 2012

FELLOWS

of the

U.S. Army Research Laboratory

2012

Approved for Public Release

Foreword

The Fellows of the U.S. Army Research Laboratory (ARL) play a critical role in how ARL advances science and engineering for our nation's Soldiers. Their leadership in a broad spectrum of disciplines allows them to continuously promote and maintain our technical excellence in science and engineering and our reputation as a state-of-the-art research laboratory. They are among the best and brightest the Army has to offer and their dedication and devotion to excellence is benefiting those who put their lives in harm's way every day.

The research the ARL Fellows accomplish for the nation is cutting edge—in many cases, their research is high-risk and can produce game-changing scientific and technological innovations that enhance the survivability and lethality of America's armed forces.

ARL is fortunate to have these world-class individuals. Their work has undoubtedly saved the lives of many American Soldiers throughout the years and has contributed immeasurably to their success as the world's most formidable fighting force.

The Fellows of ARL are and will continue to be examples of exceptional performance to which we can all emulate.

Dr. John Pellegrino
Director (A)
U.S. Army Research Laboratory

ARL Fellows: A Brief History

In 1989, Brigadier General Malcolm R. O'Neill, U.S. Army Laboratory Command (LABCOM) Commander, and Richard Vitali, director of Corporate Laboratories, conceived the idea of an honorary advisory body of senior scientists and engineers, drawn from throughout the command. Patterned after similar organizations, such as the Ballistics Research Laboratory Fellows, which were already in existence in some of the laboratories, the LABCOM Fellowship was to be a semi-independent, peer-elected, self-perpetuating consultative asset to the Commander. The first LABCOM Fellows (charter members) were selected by Vitali jointly with the various LABCOM Technical Directors. This group quickly proved its value, serving as LABCOM's screening panel for technical competitions, such as the Army Science Conference and the Army Research and Development Achievement Awards. The organization also drafted and approved its charter, which codified the purposes of the organization and provided a mechanism for the election of new members.

With the establishment of the Army Research Laboratory (ARL) in October 1992, Vitali became the acting director. Soon after, he requested that members of the LABCOM Fellows form the nucleus of an ARL fellowship.

Accordingly, the charter of the LABCOM Fellows was adapted to the new organization. It was approved at the first meeting of the ARL Fellows, December 1, 1992. On October 14, 1993, Dr. John Lyons, former director of the National Institute of Standards and Technology (NIST), became the director of ARL. Soon after his appointment, he accepted the charter. Under Dr. Lyons' guidance and enthusiastic support, the ARL Fellowship charted an active course. The organization met regularly, rotating its meeting sites among the ARL installations. In 1993, Dr. Lyons initiated the award of an annual stipend (originally in the amount of $25,000) that each Fellow could use to enhance his/her research capability, provide for literature, and cover conference travel and fees.

The first group of nominees to be considered for election to the Fellows was solicited from the directorate directors and elected to the Fellowship in 1993. In 1998, by amendment to its charter and at the suggestion of Dr. Lyons, the Fellowship decided to automatically recognize ARL employees who have attained the "super grade" of ST as members.

In subsequent years, the ARL Fellows performed a variety of services to ARL at the request of the Director, including evaluations of ARL technical awards, reviewing Director's Research Initiative proposals, organizing special symposia and chairing directorate promotion panels.

ARL Fellows: A Brief History *(continued)*

The Fellowship, whenever requested, will participate in reviews of the ARL Technical Program, and will serve on ARL award or promotion panels.

It is important, therefore, that members of the Fellowship not only represent the highest accomplishments in science, mathematics, engineering, and analysis, but also be capable of fulfilling their roles in this active organization.

As stated in the charter, the Fellowship would also like to be representative of ARL as a whole. To this end, the charter sets forth nomination procedures that assure a field of candidates that is representative of the entire laboratory.

Past and present co-chairs of the ARL Fellows are:

- J. Terrence Klopcic and Arthur Ballato (first co-chairs elected in July 1993)
- T. Kevin O'Brien and Carl J. Campagnuolo (April 1994)
- G. Richard Price and Charles Murphy (April 1996)
- James W. McCauley and Ron Pinnick (May 1998)
- Kenneth A. Jones and Jack "John" Rowe (October 2000)
- Bruce J. West and Betsy M. Rice (October 2003)
- Russell S. Harmon and Tomasz Letowski (October 2005 - October 2007)
- Arunachalam "Raj" Rajendran and Ananthram Swami (April 2008)
- Ananthram Swami and Peter Reynolds (October 2008 - October 2009)
- Peter Reynolds and Melanie Will-Cole (April 2010)
- Melanie Cole and Joseph Mait (October 2010 - October 2011)
- Rose Pesce-Rodriguez and Kwong-Kit Choi (April 2012 - Present)

Fellows of the U.S. Army Research Laboratory

Jan Andzelm

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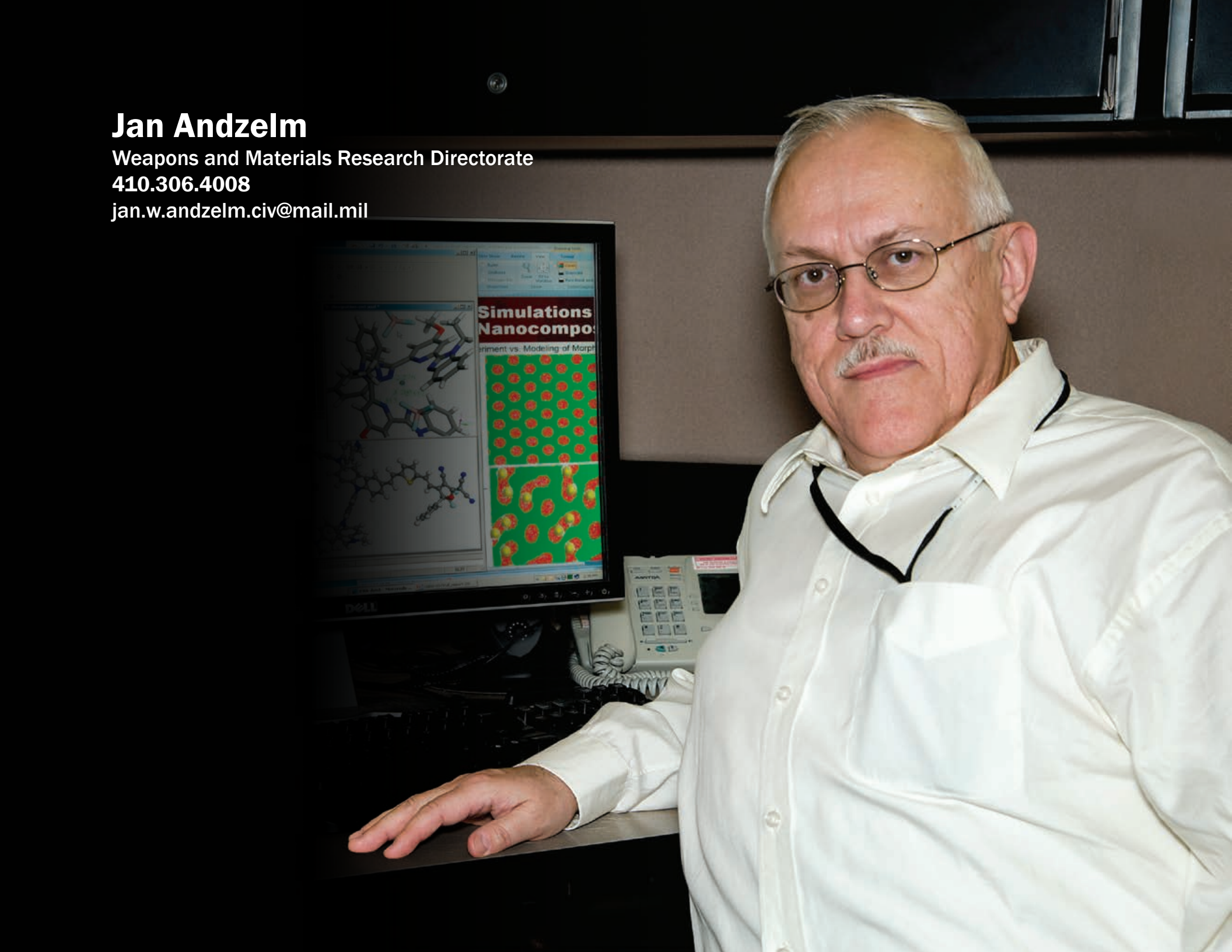


Research Interests

Jan Andzelm's research is focused on developing and applying computational methods to study the properties and chemical processes of macromolecular materials, such as supramolecular complexes, polymers, and biopolymers, that are ubiquitous in Army applications.

Computational characterization of macromolecular materials requires the use of multi-scale methodology efficiently optimized for Army High Performance Supercomputer resources. Dr. Andzelm's expertise lies in multi-scale modeling at the quantum mechanical, atomistic and mesoscale levels. The chemical reactions and optical properties of molecular systems can be best characterized by quantum mechanical methods such as density functional theory (DFT). The thermodynamic properties of a material, including understanding its response to mechanical or thermal shock, are studied using classical atomistic simulations. The slow processes of polymer self-assembly or the mechanical response of entangled biopolymer systems can only be characterized by exploiting mesoscale approaches.

Dr. Andzelm is interested in materials informatics and inverse design approaches that have the potential to predict a priori the performance of macromolecular systems. This facilitates the rational design of these materials, limiting the costly experimental effort required for their synthesis and evaluation.

Currently, Dr. Andzelm is involved in developing novel DFT quantum mechanical methodology to study nonlinear optical (NLO) properties of molecular systems that can be used in Soldier protective devices. Dr. Andzelm is pursuing unique approaches to build and optimize polymer and biopolymer networks with tunable mechanical damping, and to study mechanical response of macromolecules at high strain rates. He also has an interest in emerging mesoscale techniques to characterize the self-assembly of polymer nanocomposites and elucidate the behavior of glassy polymers.

Biography

Dr. Andzelm received his Ph.D. degree in theoretical chemistry from the University of Warsaw in Poland, where he developed a quantum mechanical method to accurately calculate interactions in small molecules and ionic solids. He subsequently worked as a postdoctoral fellow at the University of Alberta, Canada. From 1984 to 1987, he was a research associate at the University of Montreal, where he worked on DFT, which was a new promising alternative to other quantum chemistry approaches.

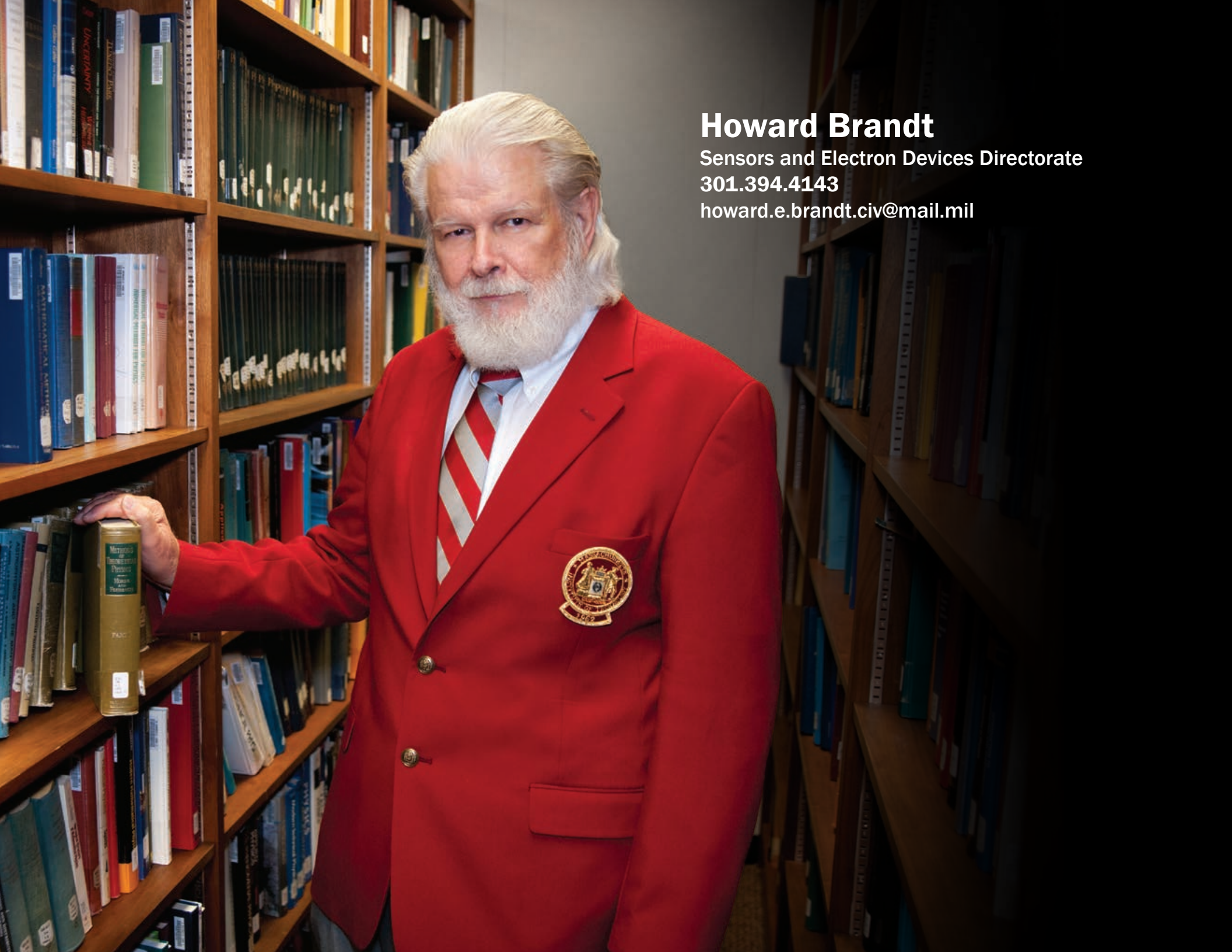
Dr. Andzelm was then hired by Cray Research, Inc., a U.S. supercomputer company, to develop a DFT program for chemistry and biochemistry applications. In 1991, he moved to the software company Biosym/Accelrys, where he further extended DFT methodology to study chemical processes in various materials. Dr. Andzelm joined ARL in 2006 as a computational chemist in the Materials Division of ARL's Weapons and Materials Research Directorate, where he is leading efforts to develop and apply multi-scale simulations of macromolecules.

Dr. Andzelm has made a lasting contribution to the development of DFT methodology for chemistry, including more than 100 scientific papers and book contributions with about 6,500 citations, which have generated an h-index of 33.

Dr. Andzelm developed the first DFT program that achieved a speed of 1GFlops on parallel computers and was capable of optimizing electronic and geometrical structures of molecules. He co-organized the first conference on DFT methods in chemistry and was co-editor of the first book on this subject. While working in the software industry, he was awarded National Institute of Standards and Technology (NIST) and National Institutes of Health (NIH) grants to support his research and received several software industry awards. He was also named a Fellow while at Accelrys.

While at ARL, Dr. Andzelm has been awarded the 2009 U.S. Army Research and Development Achievement Award for inverse design of novel NLO materials. Currently, Dr. Andzelm is directing several computational projects interpreting and predicting new phenomena in macromolecules in close collaboration with colleagues who are experimentalists. He is also leading development of computational methods to study polymer deformations under high strain rates. Dr. Andzelm was named an ARL Fellow in 2010.

Dr. Andzelm has been married for 35 years and has one daughter. He enjoys mountain hiking, reading about world history and watching science-fiction movies.



Howard Brandt

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Research Interests

Howard Brandt has broad research interests in theoretical physics, including quantum field theory, quantum computation, quantum cryptography, quantum optics, general relativity and non-neutral plasma physics. Most recently, his research has concentrated on quantum information processing, including quantum computing and quantum cryptography. Quantum computing offers the possibility of rendering most classical encryption protocols obsolete. Quantum cryptography enables the possibility of unconditionally secure communications.

Dr. Brandt's current research includes: quantum information processing, Riemannian geometry of quantum computation, quantum circuit complexity analyses, Finsler geometry, quantum field theory and maximal proper acceleration.

Previous research by Dr. Brandt focused on the development of high-power microwave directed-energy sources. Included in that work were instability analyses of relativistic electron beams, and extensive work on the theory of non-neutral plasmas and electron beam-plasma turbulence.

Biography

Dr. Brandt was born in Emerado, North Dakota, and attended schools in Washington state and Germany. He was a National Sloan Scholar at MIT, where he received his Bachelor of Science degree in physics in 1962. He received his Master of Science degree in physics in 1963, and his Ph.D. degree in physics in 1970 from the University of Washington. His doctoral thesis was a fundamental contribution to quantum electrodynamics.

Prior to joining ARL in 1976, he taught physics and mathematics at Seattle Preparatory School, was a post-doc in general relativity at the University of Maryland, and consulted for the Defense Department in optics, acoustics and radar.

From 1986 to 1995, he directed three major programs for the Office of Innovative Science and Technology of the Strategic Defense Initiative Organization, involving research on high-power microwave source development, sensors for interactive discrimination, and electromagnetic missiles and directed energy concepts.

He received the Siple Medal, the Hinman Award and the Ulrich Award from the Department of Army in connection with his pioneering basic research on high-power microwave source development. Dr. Brandt is the inventor of the Turbutron, a high-power millimeter-wave source; co-inventor of a quantum key receiver based on a positive operator valued measure; and inventor of a quantum cryptographic entangling probe.

Dr. Brandt has published many refereed papers on quantum cryptography, quantum decoherence, quantum field theory, general relativity, differential geometry, optics, radiative instability and plasma physics. He is a frequent invited reviewer for Mathematical Reviews of the American Mathematical Society. He is Editor-in-Chief of the journal *Quantum Information Processing*. He received a major achievement award from ARL for his publications and research on quantum information processing. Dr. Brandt also received the ARL 2004 Science Award. In 1998, he was an invited participant in the program on Complexity, Computation, and the Physics of Information, and in 2004, in the program on Quantum Information Science at the Isaac Newton Institute for Mathematical Sciences at the University of Cambridge, United Kingdom (UK).

Dr. Brandt served as principle investigator for a five-year research project on "Exploratory Development of Quantum Information Processors" for a Defense Advanced Research Projects Agency (DARPA) program on Quantum Information Science and Technology, and is performing path-breaking research in quantum computing and quantum cryptography. DARPA is the central research and development organization for the Department of Defense.

He is also a Fellow of SPIE, the International Society for Optics and Photonics. His biography is in *Who's Who in America, Who's Who in the World*, and *American Men and Women of Science*. He is a member of the American Physical Society, American Chemical Society, American Mathematical Society, American Optical Society, American Association of Physics Teachers, Mathematical Association of America, Institute of Physics (UK), and the International Society on General Relativity and Gravitation.

Dr. Brandt's outside interests include philosophy, theology, art and classical music.

Kwong-Kit Choi

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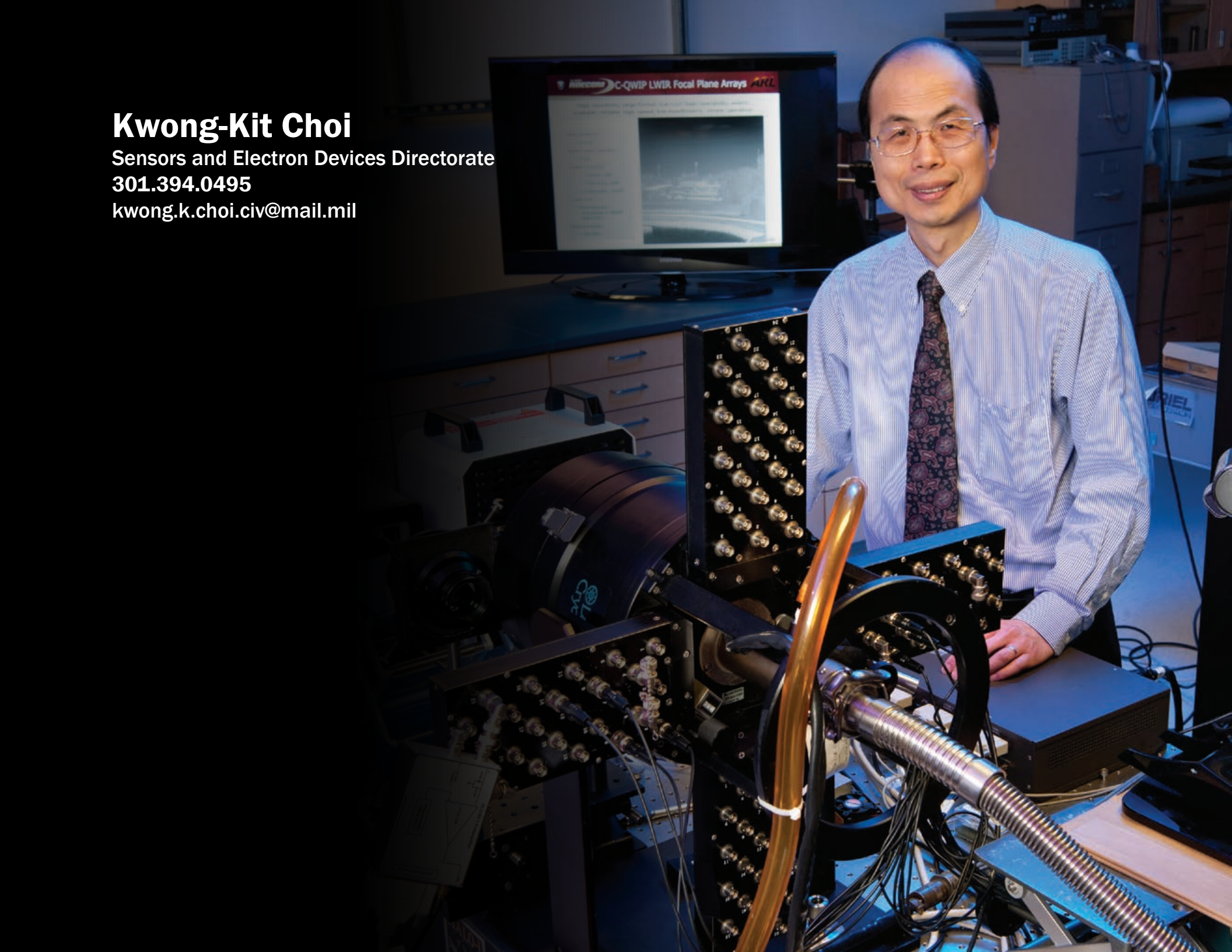

Research Interests

Kwong-Kit Choi, who co-invented the quantum well infrared Photodetector (QWIP) at AT&T Bell Laboratories, is the founder of a new infrared technology that is being deployed by the military as the next-generation advanced infrared sensor.

QWIP imagers are also used in civilian applications, such as in anti-oil pollution monitoring (by the Dutch Coast Guard), cancer diagnostics (U.S. and Germany OmniCorder BioScanIR System), and infrared astronomy (U.S. Palmer Hale Telescope).

Dr. Choi currently works to develop more advanced, higher sensitivity, higher resolution, and multi-band imagers.

His research is also funded by NASA to design optimum QWIP detectors used in Landsat satellites and to produce large format broadband imagers used to acquire spectral information of the Earth and universe for global warming studies, for environmental protection, and for ground-based and space-borne astronomy.

Dr. Choi's research further advanced the technology. His inventions include the infrared hot-electron transistor for higher sensitivity and faster response time, the multi-color QWIP for temperature sensing, the corrugated-QWIP for broadband detection and polarization-sensitive detection, and the quantum grid infrared photodetector for adaptive hyperspectral imaging and nanoscience research.

Collaborating with Goddard Space Flight Center, he made the first highest-resolution 1024 x 1024 long wavelength QWIP focal plane array camera, and extended thermal imaging to the wavelength of 16.2 microns. He also demonstrated the highest quantum efficiency and the broadest spectral band QWIP cameras to date. As an example, a camera based on corrugated-QWIPs was found to be most sensitive in detecting small targets in a detection contest in 2007. C-QWIP cameras have been deployed by NASA for Mission to Mars study and environmental sensing in Southeast Asia, and are serving missions at the Missile Defense Agency, Navy and other defense agencies.

Other technical contributions include the invention of four spectroscopy techniques for device and material characterization, and the invention of quantum collector transistors for high-speed digital and analog applications.

Dr. Choi also made significant contributions to fundamental solid-state physics in the area of electron localization, many-body interactions, quantum Hall effects, material defects and electromagnetic modeling.

Biography

Dr. Choi received his Bachelor of Science degree in physics from Hong Kong University in 1979, and Ph.D. in physics from Yale University in 1984. From 1984 to 1986, he worked at Princeton University, and from 1986 to 1987, he worked at AT&T Bell Laboratories. Since 1987, he has been with ARL working on the science and technology related to optoelectronic devices.

He has authored and co-authored 106 refereed journal articles and is sole author of six book chapters; is the author of *The Physics of Quantum Well Infrared Photodetectors*; has been awarded 13 patents; and has given 61 invited talks. His publications have been cited in the open literature more than 3,765 times.

Dr. Choi is the ARL senior research scientist for physical sciences. He is also a Fellow of the American Physical Society, a Fellow of the Institute of Electrical and Electronics Engineers, and is a member of the International Society for Optical Engineering (SPIE). He is an inductee of the NASA Space Technology Hall of Fame and a recipient of the distinguished Presidential Rank Award.

Melanie Will-Cole

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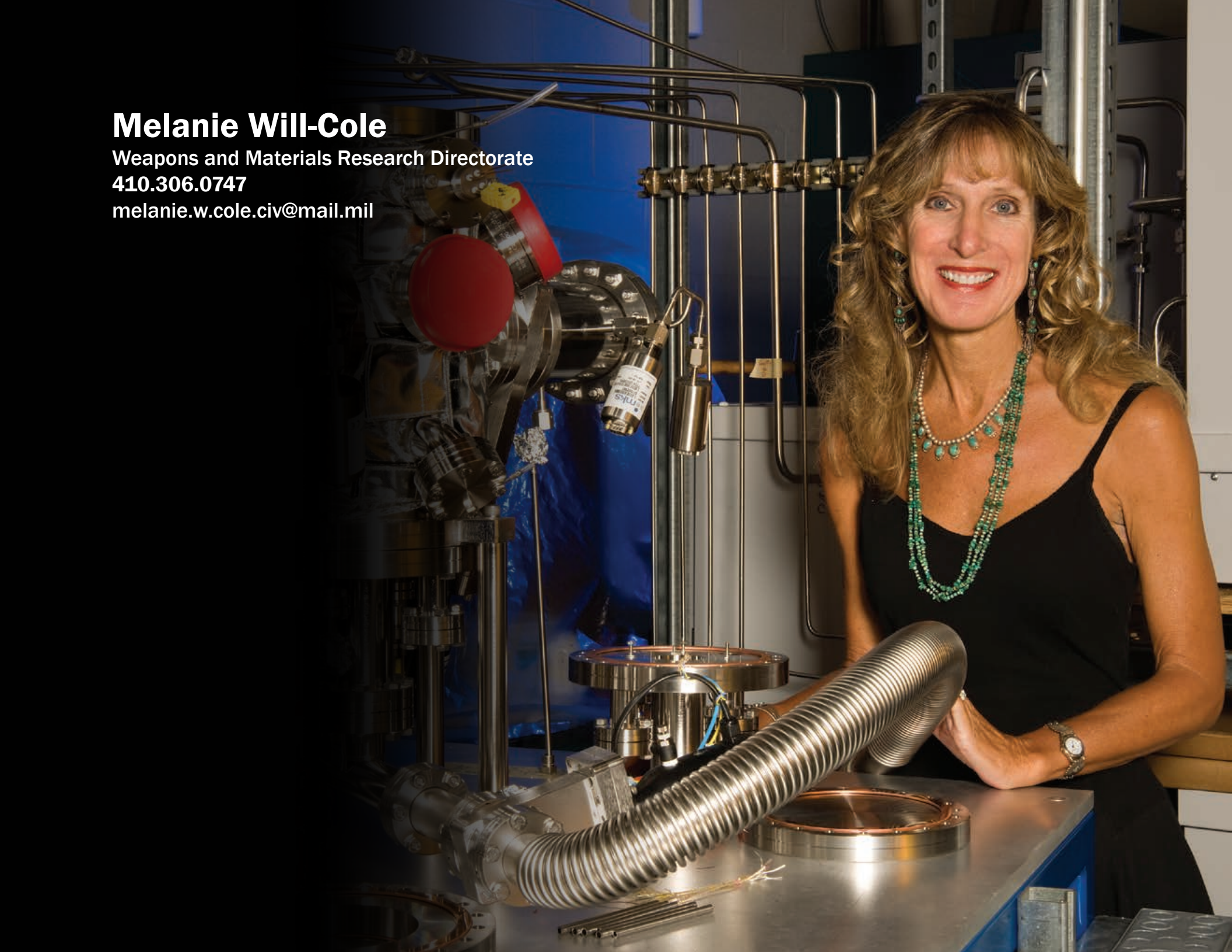

Research Interests

Melanie Will-Cole's current research interests are focused on fundamental and applied research in the areas of growth, properties and processing science of thin film electronic materials for use in the next generation of microwave communications devices. Her research focuses on advancing basic science concepts to ascertain the complex relationship among materials, process and design that affects device performance and reliability, and applying these new discoveries into practical applied science and engineering for microwave device/system applications. Ms. Will-Cole and her research team have developed complex oxide thin film material designs, growth and processing solutions to enable high Q, temperature stable, enhanced tunability frequency agile devices. These enhanced performance tunable devices are critical components (in test-bed activities) for the Army's first On-The-Move (OTM) electrically scanned phased array antenna, and Joint Tactical Radio System (JTRS) man-portable and embedded radios for dismounted infantry.

From 1990 to 2001, Ms. Will-Cole's research focused on the physics of electronic thin films, process science of advanced semiconductor materials, surface science and interface phenomena, and application of nano-scale characterization techniques to understand thin film interface relationships. Melanie Will-Cole's pioneering research in determining the nature and origin of dry etch-induced surface modifications, and material defects as a function of critical dry etch processing methods and parameters, fostered the development of today's "low-damage/high performance" dry etch methodologies, which are the enabling technologies for advanced microwave and power devices. In collaboration with her research colleagues at Bell Laboratories, Melanie Will-Cole introduced innovative metallization designs and fabrication techniques to enable high performance Ohmic and Schottky contacts for compound semiconductors, such as GaAs, InP, SiC and GaN. Ms. Will-Cole's electronic materials research contributions were crucial for the demonstration of state-of-the-art performance of high speed compound semiconductor electronic devices—High Electron Mobility Transistors (HEMTs), Heterojunction Bipolar Transistors (HBTs) and Metal-Oxide Semiconductor Field-Effect Transistors (MOSFETs). She is widely recognized for her investigation of metal contacts for SiC high temperature and high power electronic devices, whereby this work has had significant impact for both the next generation of military electric guns and hybrid-electric vehicles.

Biography

Melanie Will-Cole is a research physical scientist and Leader of the Integrated Electromagnetic Materials Research Team at ARL's Weapons and Materials Research Directorate (WMRD). She holds a Bachelor of Science and a Master of Science in geology. Ms. Will-Cole's tenure at ARL began in 1988 at the Electronics, Technology and Devices Laboratory, Ft. Monmouth, New Jersey, which later became part of ARL's Sensors and Electron Devices Directorate, where she held positions as research physical scientist and Leader of the Electronics Materials Process Science Team. In 1998, Ms. Will-Cole joined ARL's WMRD, whereby she shifted her technical research thrusts from semiconductor materials research towards the development of complex oxide thin film materials for frequency agile microwave communications and radar systems.

Melanie Will-Cole has published over 133 (approximately 57 percent as lead author) refereed journal articles, 126 conference papers, and has presented 256 talks (approximately 65 percent invitational) at national and international conference; holds 10 U.S. Patents; and has authored five invited book chapters. Her publications have been cited over 2,500 times. Ms. Will-Cole has received four Army Research and Development Achievement Awards (1992, 1996, 2005, 2007) and ten Director's Research Initiative (DRI) awards, and was the recipient of the 2008 Society of Women Engineers (SWE) Lifetime Achievement Award for Lifetime Achievements and Sustained Contributions to the Field of Engineering, whereby SWE credited her "for pioneering research contributions, experimental creativity and innovation in developing a fundamental understanding of the complex relationships between the structures, processing and properties in thin film electronic materials." Melanie Will-Cole is a member of the International Materials Research Congress, the American Ceramics Society, Materials Science and Technology, and the Mexican Academy of Materials Science. Ms. Will-Cole holds an adjunct research position in applied physics at Caltech and is on the editorial boards of three technical journals. She has developed a stable "Mission and Customer Funding-Base" for electronic materials research and holds a sustained record for technology transition via intellectual property, Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR), and ManTech Programs.

Melanie Will-Cole is an avid patron of the arts; as a native New Mexican, she sustains her cultural heritage as a collector of Mexican, Navajo, Hopi and Acoma art. She is also an accomplished artist, having created oil and watercolor paintings. Melanie enjoys Latin dancing, Balanchine ballet, Spanish guitar and hard rock music. She loves Zumba, tennis, biking, hiking, skating, weightlifting and wine-tasting. Most of all, she enjoys quality time with her husband, Bob, and their daughter, Alexandria, and all their pets; five cats, a dog and a horse.

Dattatraya Dandekar

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Research Interests

Dattatraya Dandekar's interests as a research physicist include: elastic constants of solids at hydrostatic high pressures and temperatures; response of solids under single and repeated shock wave propagation; stability of pore/voids under high pressure; dispersion of sound waves in composites; shear and spall/tensile strength of solids; phase transformations; equation of state; low temperature calorimetry; sound speed in porous material; dielectric constants of porous solids; and compaction of powders for material synthesis. He studies metals, alloys, ceramics, glass, polymers, metal matrix and polymer matrix composites, and plasticized polymers.

Through dynamic mechanical testing, Dr. Dandekar determines and quantifies the role of elastic and inelastic deformations under shock wave compression, release, and tension on the generation of defects; characterizing resulting failure of materials; and discovering possible means of avoiding the failure. This work also provides material parameters used in the modeling of material.

In addition, he uses complex, novel, non-standard experiments providing results that test the generality of material models.

In early 1991, Dr. Dandekar was instrumental in developing a four-beam velocity interferometer, quadruplicating shock response of a material from a single shock wave experiment. His work also led to a better understanding of how shock waves propagate through a transparent material at four different thicknesses simultaneously, and measured the change in refractive index of a transparent material under shock compression only, under compression and release, under total release and under tension, under shock wave loading.

Biography

Dr. Dandekar received a Bachelor of Science in 1954 from Banaras Hindu University and a Master of Science in statistics in 1956 from Patna University in India. He earned master's diploma in demography in 1961 from the Demographic Research Center in Bombay.

He also earned a Master of Science in 1965 and a Ph.D. in 1967 in geophysics from the University of Chicago.

After a post-doc in materials science at Cornell University from 1967-68, he joined the physics department at Washington State University as an assistant professor and assistant physicist. During 1969, he was a research associate at the University of Chicago and performed in situ high-pressure x-ray diffraction measurements to detect phase transformation in cadmium carbonate. In 1973, he was a chemist at Lawrence Livermore National Laboratory, where he reviewed elastic wave velocity measurements on rocks and minerals at high pressures.

Also in 1973, he began working at an ARL predecessor, researching shock waves in condensed matter. In 1982, as a visiting professor in civil engineering at North Carolina State University, he helped set up a shock wave facility and taught a graduate course in shock wave interactions in condensed matter.

Under the auspices of ARL-APEX (Abbreviated Professional Assignment) he conducted research at the Ernst Mach Institute, Freiburg, Germany, in 1994, and at the Cavendish Laboratory, Cambridge, and at the Royal Military College of Science, Shrivenham, in 2001.

In 2006, as an ARL visiting scientist, he taught probability and statistics at the United States Military Academy.

Dr. Dandekar has published 137 research papers in journals, books and conference proceedings.

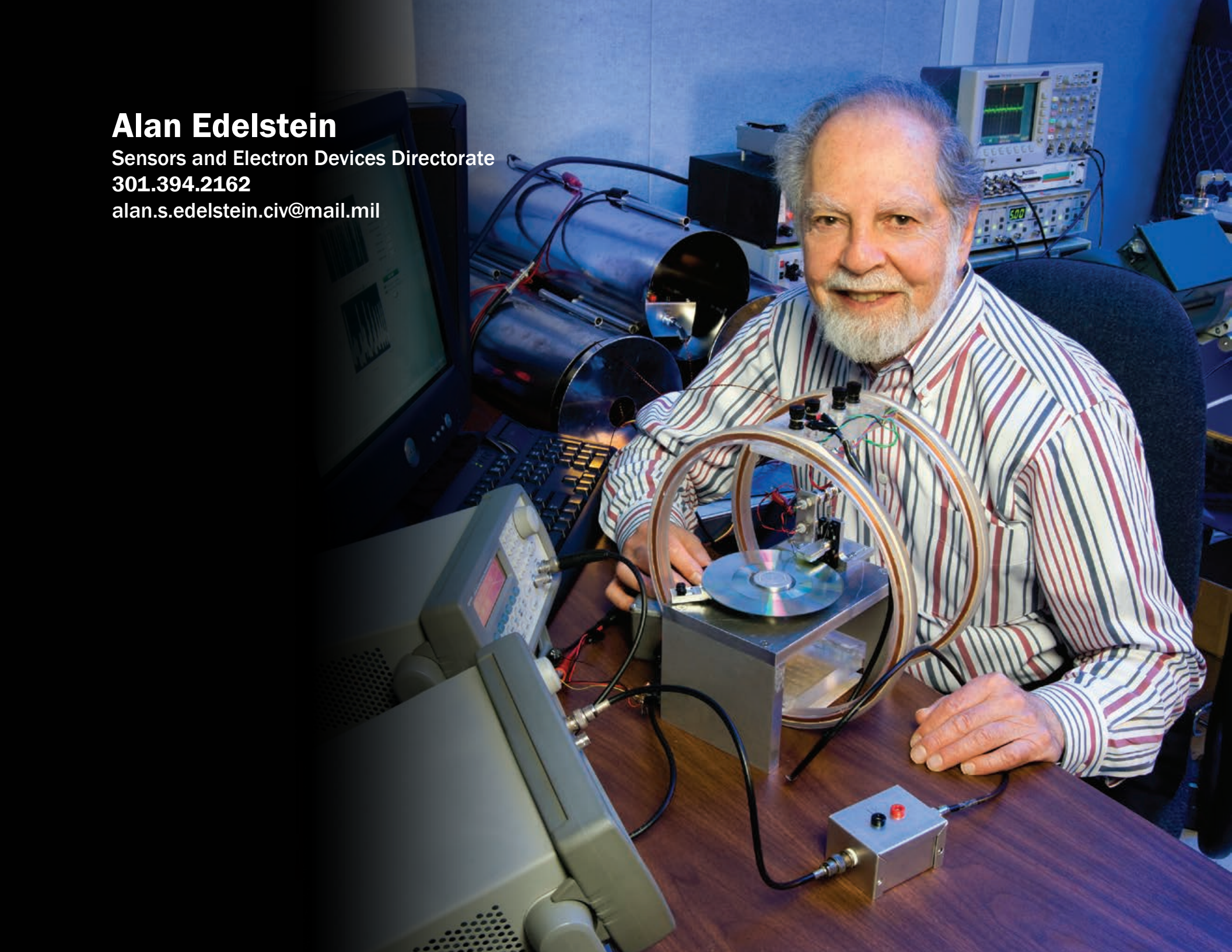
In 1990, he served on the National Science Foundation Science and Technology Center Site Review Panel. More recently, he received the Paul A. Siple Memorial Award as co-author of the best paper at the 25th Army Science Conference. In 2009 *The International Journal of Plasticity* published a special issue in honor of Dr. Dandekar.

He was elected a member of Sigma Xi in 1966, an ARL Fellow in 1994, and a Fellow of the American Physical Society in 2001, and to Pi Mu Epsilon, National Honorary Mathematics Society in 2006. He is a member of the American Geophysical Union.

In 1998, he was elected vice-chair of the American Physical Society topical group on shock compression of condensed matter, chair-elect in 1999, and chair in 2000. He also chaired the awards committee from 1993 to 1995, and in 1997, chaired the biennial international APS conference on shock compression of condensed matter and co-edited the proceedings.

He has served as an external examiner for doctoral and master's candidates at the Universities of Maryland, Texas, Delaware, and Dayton, and the Georgia Institute of Technology.

In 2010, Learnquest Academy of Music presented Dr. Dandekar its Distinguished Service Award in Music for being a nucleus and inspiration in bringing the practitioners of Hindustani and Carnatic music together and sowing seeds of continuous growth of Indian Classical music in the New England Area.



Alan Edelstein

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Research Interests

Most of Alan Edelstein's research interests have focused on studying magnetic moment formation and on magnetic sensors. Early in his career, he studied the instability of magnetism in model systems containing cerium. In the area of nanomaterials, he and Dr. Gan Moog Chow discovered one of the first examples of self-assembly, self-assembling molybdenum cubes. They found that molybdenum cubes with edge lengths of 5 nm self-assembled into larger cubes that were 2x2x2, 3x3x3 and 4x4x4 arrangements of the smaller cubes.

More recently, his work has been directed toward understanding and applying new, major discoveries in magnetism to produce significantly improved magnetic sensors. For example, magnetic tunnel junctions have been fabricated with much larger magnetoresistance. To use these junctions in magnetic sensors, he has developed a Micro Electro-Mechanical Systems (MEMS) method for modulating the field to minimize the effect of 1/f noise. He has found that applying a modulating magnetic field shifts the operating frequency and increases the sensitivity in a class of larger sensors, magnetoelectric sensors, for which the MEMS approach is not applicable.

One can use high density spin polarized currents in nano-devices to control the direction of the magnetization. This has led to (1) microwave sources whose frequency can be controlled by the magnitude of a spin polarized current and (2) an approach for the next generation of random access memory (RAM), spin torque tunneling (STT) RAM. STT RAM is non-volatile, fast, high density, and consumes very little energy. Dr. Edelstein and his ARL colleagues are working on fabricating STT RAM devices in the form of rings that will have smaller write energies and more thermal stability.

Biography

Dr. Edelstein currently leads the ARL team developing and using magnetic sensors and magnetic algorithms used for detecting ferromagnetic objects and electromagnetic sources.

Dr. Edelstein received his Bachelor of Science in Engineering Physics at Washington University. He received his Master of Science and Ph.D. in Physics from Stanford University with the support of a Woodrow Wilson Fellowship. He had postdoctoral fellowships at Stanford University and Leiden University in the Netherlands. The latter was supported by a National Science Foundation Fellowship.

He worked at the IBM Research Center at Yorktown Heights, Energy Conversion Devices, and the Naval Research Laboratory, and taught at the University of Illinois in Chicago before joining ARL. While at the University of Illinois, he was also a consultant at Argonne National Laboratory.

Dr. Edelstein has served on the Program Committee for several of the Magnetism and Magnetic Materials Conferences. His is currently the Magnetic Society Representative to the Institute of Electrical and Electronics Engineers (IEEE) Sensors AdCom. He served as Vice-Chairman of the Battlespace Acoustic Sensing, and Magnetic and Electric Sensors Military Sensing Symposia (MSS) and is a member of the program committee for their meetings. He is an MSS Fellow.

He has worked on developing magnetic sensors with the Defense Advanced Research Projects Agency (DARPA) support in a MEMS program and in the Heterostructural Uncooled Magnetic Sensor Program. He is also the Contract Officer Representative for the DARPA program on developing STT RAM.

Dr. Edelstein has 27 patents and 117 publications in refereed journals that include nine Physical Review Letters and one Science paper. There are several hundred citations to this work. He has co-edited a book, *Nanomaterials: Synthesis, Properties and Applications*. He received a Best Paper Award at the 22nd Army Science Conference 2001. He is a member of the American Physical Society, IEEE and Sigma Xi honorary society. He has been the thesis advisor of one student and has guided the career development of 10 postdoctoral fellows.

He enjoys playing tennis and chess. Dr. Edelstein is married, and has two daughters and four grandchildren.

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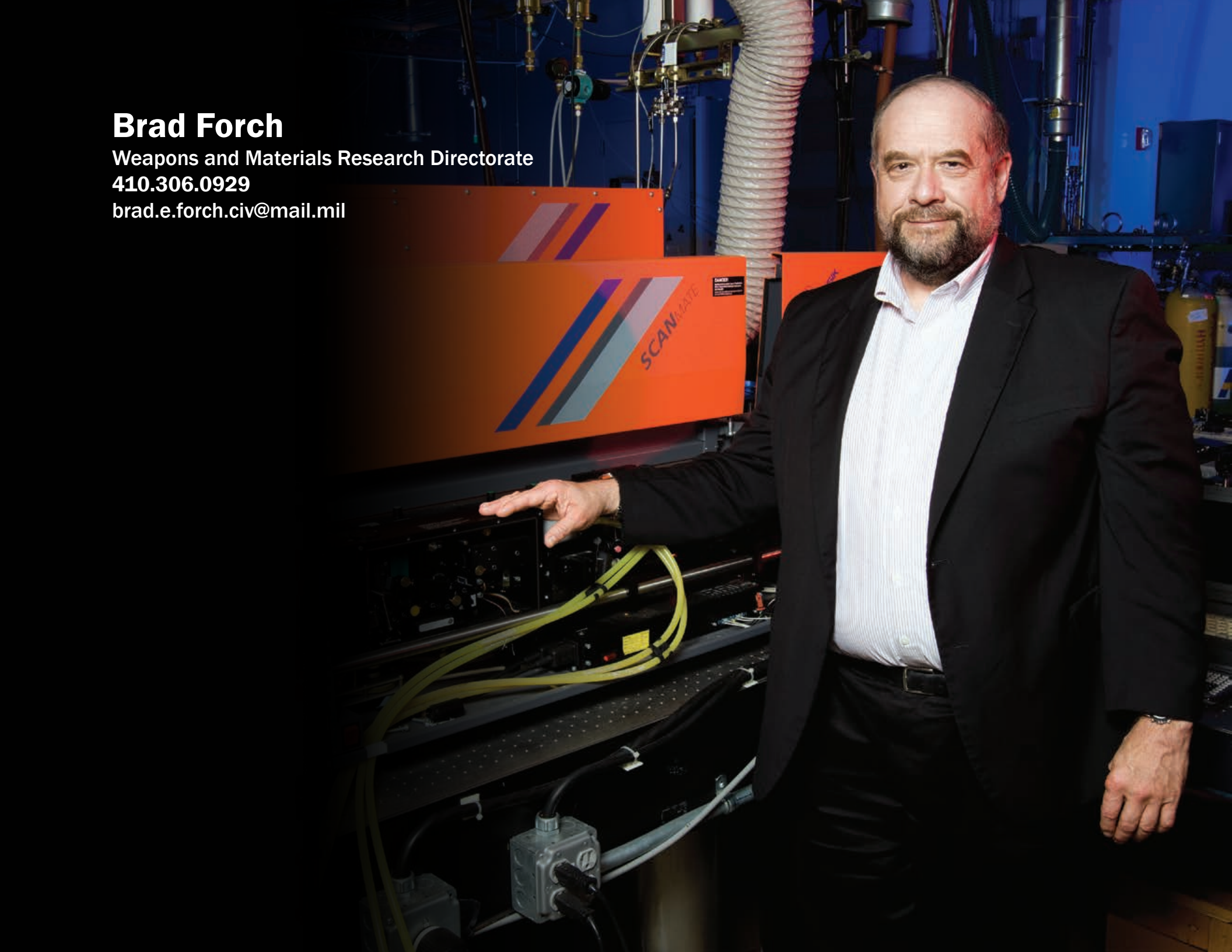

Research Interests

Brad Forch is a senior research scientist for ballistics in the Weapons and Materials Research Directorate at ARL. His general research interests are in developing the fundamental understanding of chemical and physical mechanisms controlling chemical energy storage and release in propellants, explosives, and novel energetic material structures for a weapon system applications. His specific research expertise is in the areas of laser spectroscopy, laser photochemistry, molecular beam supersonic jet spectroscopy, combustion research and laser ignition.

Throughout his Army career, he has been a strong proponent of the idea that the need for discovery from basic research does not end once a specific use is identified, but continues through numerous supporting connections to development and application activities. High-risk basic research can provide risk mitigation to extremely complex and challenging applications research programs, which lead to new capabilities for the Army. He has translated this advocacy for discovery and innovation into research and leadership contributions that have impacted the success of dozens of Army Technology Objectives (ATOs) and tri-service weapons programs. These include laser ignition for large caliber guns, novel propellants and explosives, ballistics, nano-energetic materials and reactive materials.

Biography

Dr. Forch was born in Chicago, Illinois, in 1955, and earned a Bachelor of Science degree in chemistry and a Master of Science degree in physical chemistry from Illinois State University (ISU) in 1978 and 1979, respectively. At ISU, he published several papers on the relative thermodynamic stabilities of substituted Annulenes and their anions and dianions. He received a Ph.D. in physical chemistry/chemical physics from Wayne State University (WSU) in 1984. At WSU, he published 12 papers on research in supersonic molecular beams pertaining to rotational effects in intramolecular vibrational energy redistribution, Van der Waals clusters, and ultra-fast radiationless processes in excited electronic states.

He was a National Research Council Postdoctoral Fellow at the Ballistic Research Laboratory in 1985, where he performed research in laser spectroscopy in the areas of ignition and combustion research, and was subsequently hired as a civilian employee in 1986. His research contributions led to the discovery of a new laser-based resonant ignition mechanism that rapidly transitioned to practical applications for many Army weapons systems. From 1986 to 1994, this work was the subject of intense research that fed parallel developmental efforts for large caliber weapons systems within the Army. The work led to extensive new research programs, international collaborations, and 40 Small Business Innovation Research (SBIR) programs and the creation of a new industrial capability within the U.S. During this period he published 30 journal articles, 28 technical reports and over 100 technical publications. In 1994, Dr. Forch was asked to be branch chief and served 15 years up through January 2009 as Chief of the Propulsion Science Branch, composed of approximately 60 scientists and engineers.

Dr. Forch continues to serve on the Executive Committee for JANNAF (Joint Army, Navy, NASA, Air Force); on the *JANNAF Journal*; and holds positions as the Contracting Officer's Representative (COR) for the Defense Technical Information Center (DTIC), Deputy Director for the Defense Ordnance Technology Consortium (DOTC), Army SBIR Technical Area Chief for Advanced Propulsion, Technical Director with Dr. Betsy Rice on the DoD High Performance Computing, Software and Applications Institute (HSAI) "Multi-Scale Reactive Modeling," Army representation on numerous Office of the Secretary of Defense (OSD) and intelligence community panels, and on extensive tri-service and Defense Advanced Research Projects Agency (DARPA) scientific review panels.

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Research Interests

Dr. Franaszczuk's research focuses on computational methods of signal analysis and neural modeling. Methods of electroencephalography (EEG) signal analysis include multichannel autoregressive modeling, Direct Transfer Function (DTF) method and time-frequency analysis using the Matching Pursuit algorithm. These methods allow for more detailed analysis and description of activity in brain structures as well as interactions within the brain during cognitive tasks.

His research also includes development of large-scale biologically realistic computational models of the brain structures.

His expertise in constructing computational models of the circuits formed by nerve cells could eventually improve a Soldier's ability to process information and improve current technology that allows Soldiers to manipulate computers, robots and other machines with brain activity.

Biography

Dr. Piotr Franaszczuk was born and educated in Warsaw, Poland. He received his Master of Science degree in physics and his Ph.D in physics from the University of Warsaw in 1978 and 1988 respectively. Both his master and doctoral theses were devoted to application of advanced signal processing and mathematical modeling methods to investigation of brain activity. For his doctoral thesis he received the award of Polish Ministry of Science and Education.

From 1989 to 1991, he was a Bennett Fellow in neurophysiology at the University of Maryland School of Medicine working on tetanus toxin model of epilepsy in neuronal cultures. This work led to development of realistic computational models of neural networks.

From 1992-1996, Dr. Franaszczuk divided his activities between research on advanced methods of analysis and modeling for seizure prediction in the Department of Neurology at the University of Maryland School of Medicine and teaching numerical methods and mathematical modeling in biology and medicine in the Department of Biomedical Physics, Faculty of Physics, University of Warsaw.

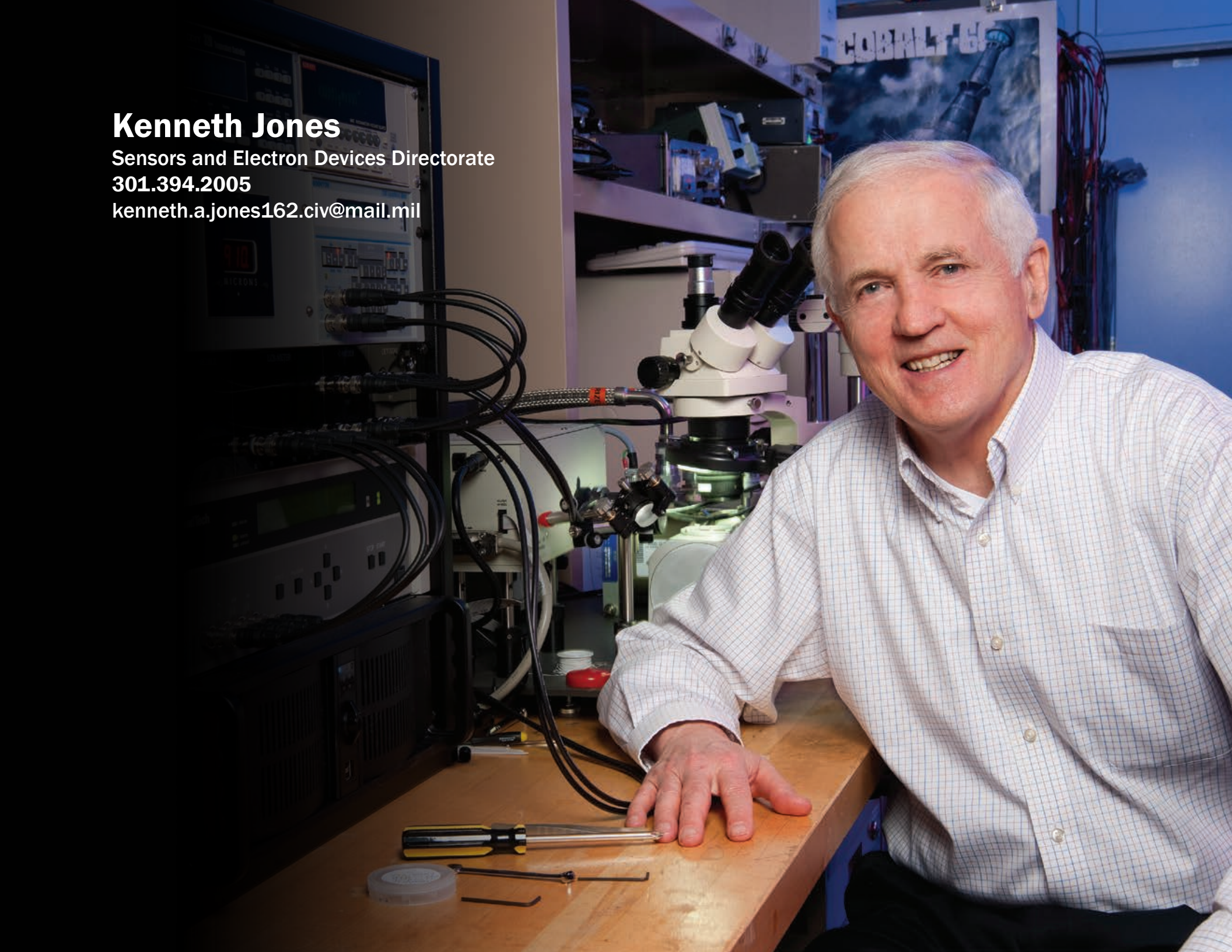
Since 1999, he has been a faculty member of the Department of Neurology at the Johns Hopkins University School of Medicine. Until June 2011, he was a co-director of the Epilepsy Research Laboratory there.

Since joining ARL in July 2011 as Senior Research Scientist in Neuroscience, Dr. Franaszczuk implements his computational methods of analysis and modeling to EEG signals recorded during tasks relevant for the Army.

He has authored and co-authored over 100 journal and conference papers and 12 book chapters.

He has been a reviewer in over 10 scientific journals and since 2005 serves as grants reviewer on several National Institutes of Health scientific review panels.

Dr. Franaszczuk's biography is listed in Marquis *Who's Who in Medicine and Healthcare*. He is an active member of Society for Neuroscience, IEEE Signal Processing Society, IEEE Engineering in Biology and Medicine Society, IEEE Computer Society, IEEE Systems, Man and Cybernetics Society and American Epilepsy Society.



Kenneth Jones
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Research Interests

Kenneth Jones' current research interests are how defects are incorporated into semiconductor materials and how they affect the device characteristics and reliability of the devices fabricated from them.

While working on the semiconductor, SiC, used in hybrid electric vehicles to enable them to operate more efficiently, he and his ARL colleagues have demonstrated that ion-induced defects that degrade device performance persist, and they are working with academia and industry on ways to circumvent them. Much of this work was done collaborating with the University of Maryland under the auspices of the Power Electronics and Energy Research (PEER) Program and with RPI and Cree Research under the auspices of the Collaborative Technology Alliance (CTA) Program.

He and his ARL colleagues have shown how mismatch dislocations degrade the properties of the device, and are working with a Tri-Service/Defense Advanced Research Project Agency (DARPA) team to learn ways to mitigate their effects.

His areas of specialization are growth, processing and characterization of wide band gap semiconductor device structures.

Biography

Dr. Jones currently leads the ARL team working on wide band gap semiconductor materials and devices that are used for high power electronic and high power radio frequency (RF) device applications.

Dr. Jones received his Bachelor of Science as an Alfred P. Sloan National Scholar and his Master of Science in engineering science from Dartmouth College. He received his Ph.D. in materials science with the physics of solids option from MIT with the support of a National Science Foundation Fellowship.

He worked at the 3M Research Labs and taught electrical engineering at Dartmouth, Colorado State University and the University of Massachusetts before joining the Army Electronics Technology and Devices Laboratory, which later became part of ARL. Dr. Jones retained his ties to academia by teaching at Rutgers and serving on the physics advisory board for the New Jersey Institute of Technology, and has taught at the University of Maryland since his relocation to the Washington, DC area.

Dr. Jones was a member of the Electronic Materials Committee for 12 years, served as member of the American Association for the Advancement of Science Panel that investigated generating electrical power using solar cells in geosynchronous orbits, was the conference chairman for the International Semiconductor Device Research Symposium (ISDRS), and has been a guest editor for *Solid State Electronics*. During a sabbatical in 1995, Dr. Jones worked on heterojunction bipolar transistors (HBT's) at the United Kingdom's Defence Research Agency, and tested their low temperature properties at the Cavendish Laboratory at Cambridge.

He was a member of the DARPA Microwave/Millimeter-wave Monolithic Integrated Circuits (MMIC) Epitaxial Characterization Team. More recently, that group was reassembled by DARPA to characterize wide band gap semiconductor devices and to study ways to improve their reliability.

Dr. Jones has received Army Research and Development Achievement Awards in 1993, 1996 and 1999, and he was given the Achievement Medal for Civilian Service in 2003 and 2004. He has 135 refereed journal publications, 230 conference presentations, seven patents, and he is the author of *Introduction to Optical Electronics* (1987). He is a senior member of the Institute of Electrical and Electronics Engineers and a member of the Materials Research Society. He is also a member of the Phi Lambda Mu and Sigma Xi honorary societies.

An avid tennis player, Dr. Jones has played on a number of championship teams.

He also enjoys hiking, is a member of a number of conservation groups, is active in groups concerned with science and public policy, is a student of history, especially European history during the Reformation, and is a member of the Board of Trustees of his Unitarian Church. Most of all, he shares his love of learning and appreciation of nature with his three children and four grandchildren.

T. Richard Jow

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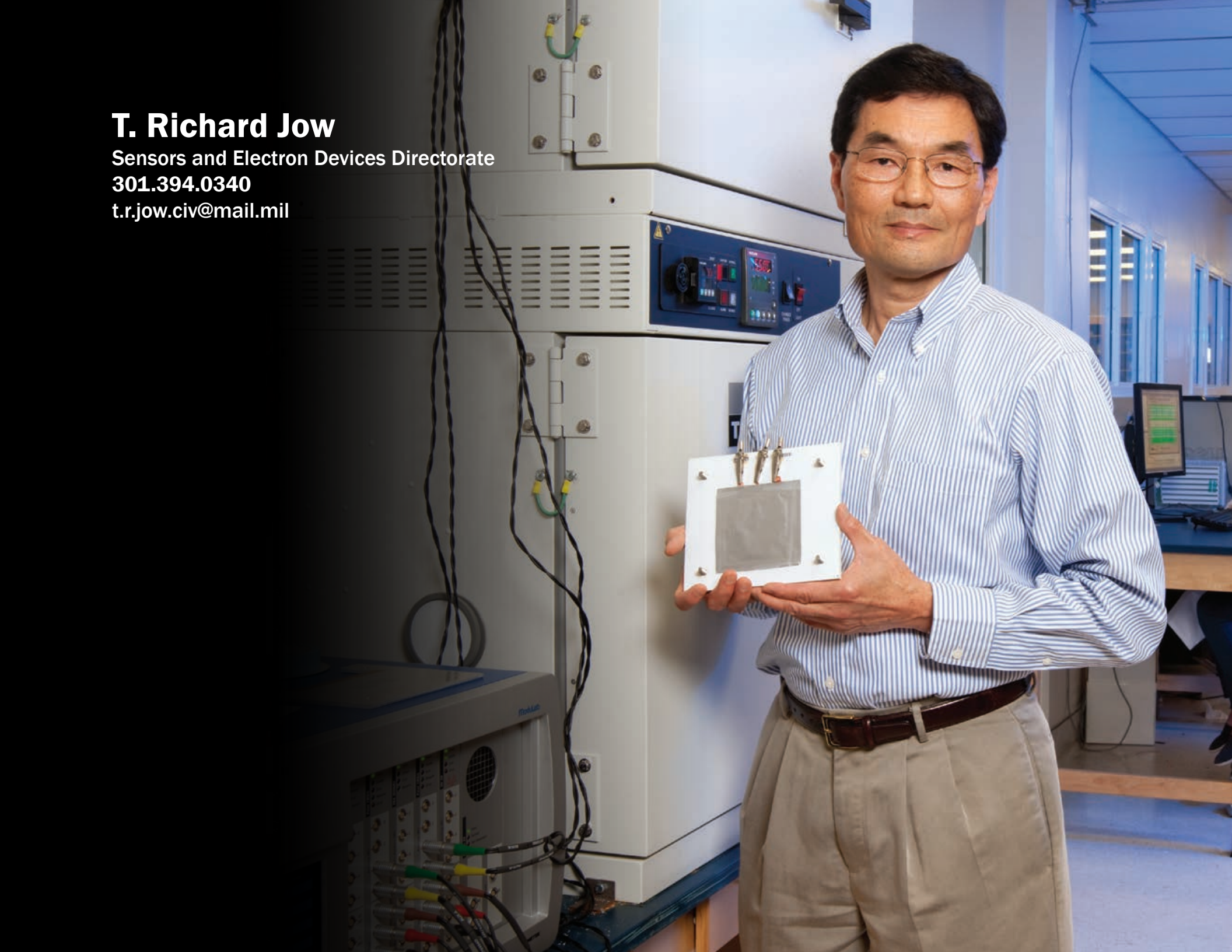

Research Interests

Richard Jow's current research interests are focused on the development of high energy density and power density energy storage materials, devices, and applications.

The energy storage devices include electrochemical energy storage devices, such as lithium-ion batteries and electrochemical capacitors (e.g., double layer, pseudo-capacitors, and supercapacitors) and electrostatic energy storage devices, such as dielectric capacitors.

The applications range from small power sources for portable devices, such as cell phones, cameras, laptop computers, and communication equipment, to large power sources for hybrid electric vehicles, and space and directed energy weapons. The power required ranges from milli-watt to giga-watt and from continuous to pulsed applications.

The device fabrication, design, and assembly are important for maximizing the energy storage performance. However, the key drivers for advancing the energy storage devices for higher energy and power density, longer life, and safety operation are still materials and materials related processing. The materials of current interests include lithium intercalation compounds, ionic conducting materials, and dielectrics.

These efforts have direct impacts on weight, size, and operation life of the devices carried by Soldiers and used on vehicles. The fields of research specialization include solid state chemistry, solid state physics, electrochemistry, organic and inorganic chemistry, polymer science, and dielectrics.

Biography

Dr. Jow currently leads the ARL team developing advanced energy storage materials for high power electrochemical and electrostatic energy storage devices.

Dr. Jow received his Bachelor of Science and Master of Science in physics from National Tsing Hua University, in Hsinchu, Taiwan, China, in 1969 and 1972, respectively. He received his Ph.D. in materials science and engineering from Northwestern University in 1977.

He worked for Wilson Greatbatch Ltd. in New York from 1977 to 1982 as a member of the senior technical staff developing new cathode materials and solid electrolytes for rechargeable lithium batteries. He then worked for Allied-Signal from 1982 to 1988 in Morristown, New Jersey, and as a senior chemist responsible for the development of conducting polymer/Li alloy composite based lithium-ion batteries.

Dr. Jow joined ARL in 1989, where he has initiated several projects. He was the senior investigator of a project that applied microcalorimetry to the investigation of the earliest claims of "cold fusion," and was the senior author of the earliest paper disputing the validity of those claims.

He also initiated a research activity on electrochemical capacitors—supercapacitors—that resulted in the discovery of amorphous ruthenium oxide for capacitors, and the recognition of the importance of the role of the electrolyte in assessing the theoretical energy density of this type of energy storage device.

Dr. Jow transitioned his team's research to the development of technology for lithium-ion batteries in the late 1990s. His team is recognized nationally and internationally as a leader in research on electrolytes for such batteries. He has also contributed to the advancement of dielectric materials for energy storage capacitors. He has mentored more than eight postdoctoral associates into successful careers in academic, industrial, and governmental laboratories.

Dr. Jow received the Allied-Signal Inventor's Award in 1988, the ARL Technical Achievement Award in Science in 1996, and the Army Research and Development Achievement Award in 1996, 1999, 2001, 2002, and 2011. He has authored/co-authored more than 110 journal publications and received 19 U.S. patents.

He has published over 140 articles and his works have been cited in more than 2,800 articles.

He is a member of the Electrochemical Society and has organized the Symposium on "Nonaqueous Electrolytes for Lithium Batteries" for the Society Meeting since 2006.

Outside of work, Dr. Jow enjoys reading, traveling, hiking, skiing, and running.

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Research interests

Shashi Karna's research is focused at understanding structural and functional properties of nanomaterials by experimental and theoretical investigations.

At the nanoscale, materials exhibit unique optical, electronic, magnetic and optoelectronic properties that offer the possibilities of developing novel technologies and new capabilities. In order to exploit the unique properties of nanomaterials for useful applications, however, researchers must understand the fundamental properties of matter and their relationships with the structure at nanoscale.

Such an understanding would allow investigators to engineer and develop new materials with tailored properties for applications in Soldier technologies. One area of Dr. Karna's research is the understanding of the fundamental mechanism of electron transport through nanomaterials, such as carbon nanotubes, nanometer-sized atomic clusters or quantum dots and organic molecules. Another important area is the fundamental understanding of nano-bio hybrid systems and their applications in Soldier technologies.

Biography

Dr. Karna was born in the Bihar province of India on July 27, 1956. He earned a Bachelor of Science degree in math, physics and chemistry from Bhagalpur University, India and a Master of Science and Ph.D., both in physical chemistry, from Banaras Hindu University, India in 1976 and 1983, respectively.

Prior to joining ARL in 2002, Dr. Karna worked as a senior scientist, chemist and senior chemist at the Air Force Research Laboratory at Kirtland AFB between 1995-2002, where his research focused on defect physics in electronic materials and physics of molecular electronics.

His previous research activities involved theory of nonlinear optical effects in silica glass performed at the Air Force Research Laboratory from 1994 to 1995, nonlinear optical effects in organic materials at the State University of New York, Buffalo from 1990 to 1994, theory and computation of nonlinear optical properties at IBM Corporation, Kingston, New York from 1989 to 1990, and first-principles configuration interaction studies of molecular electronic states at University of New Brunswick in Fredericton, Canada.

Dr. Karna has published 117 refereed technical papers, seven book chapters, three technical magazine articles, and more than 200 conference proceedings and abstracts. He is a co-recipient of the 2010 Paul A. Siple Memorial Award for the "Best Overall Paper" at the 27th Army Science Conference and the 2011 IEEE NANO "Best Paper" award.

He has also co-edited three books, including the *Defense Applications of Nanomaterials*.

Dr. Karna is a member of the American Chemical Society and the American Association for the Advancement of Science, a senior member of the Institute of Electrical and Electronics Engineers, and an elected Fellow of the American Physical Society and the Optical Society of America.

From 2004-06, he was the U.S. member of the NATO Exploratory Team on Smart Textiles for the NATO Soldier, and currently serves as the chair of the NATO Research Technical Group on Smart Textiles for the NATO Soldier.

Dr. Karna holds an Adjunct Professor position at Michigan Technological University, Houghton, Michigan, and at the Morgan State University, Baltimore, Maryland, and serves on the External Advisory Board of the Mechanical Engineering-Engineering Mechanics Department of Michigan Technological University.

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Research Interests

Stephen Lee's research focuses on dynamic combinatorial chemistry, catalysis, synthetic organic chemistry, and DNA supramolecular assemblies that might protect the Soldier from hazardous chemicals and biological organisms.

He is exploring dynamic combinatorial chemistry and catalysis research to identify new catalysts and molecular binders that might be used in chemical and biological agent decontamination and detection. Dynamic Combinatorial Chemistry (DCC) is a recently evolved approach to discovering new synthetic receptors for binding analytes of interest.

The theory is simple and elegant: if a dynamic mixture of compounds with receptor-like properties is allowed to bind to a host capable of binding some of the members of that mixture, then the equilibrium distribution of constituents shifts toward those that best bind the analyte (lowers the free energy of the system).

DCC enables researchers to selectively amplify binding assemblies for studies on sensors, catalysts, molecular recognition, cell adhesion, cell communication, and a whole host of biochemical signal transduction events. The development of new methods for discovering good binders can contribute to a broad range of scientific topics. The fundamentals of this work might contribute to protection of the Soldier through new catalysts for decontamination and sensing of chemical warfare agents.

Dr. Lee's work on supramolecular assemblies is directed towards the synthesis and characterization of novel DNA-based molecules, which might be used for detection or gene transfection. New DNA-base modified small molecules are being developed that can bind and sense the presence of native DNA. These new structures might help signal the presence of DNA or help DNA move into living cells for transfection.

Dr. Lee is also engaged in research and technologies for the Military Working Dog.

Biography

Dr. Lee received a Bachelor of Science from Millsaps College, Jackson, Mississippi, in chemistry and biology and a Doctorate of Philosophy from Emory University in physical organic chemistry. At Emory University, his research included the synthesis and characterization of novel self-assembling nanostructures, such as micelles and vesicles. Specifically, his research in the manipulation and chemical characterization of giant unilamellar vesicles is ground-breaking research bridging the macroscopic and nanoscale research areas. Ultimately, the novel supramolecular systems hold potential for use in sensors, decontamination and medical therapeutics.

Dr. Lee was also a Chateaubriand Fellow at the Université Louis Pasteur in Strasbourg, France, studying origin of life chemistry. His work in Strasbourg included the isolation and characterization of novel amphiphilic molecules that might have been primitive precursors to the cell membranes found in all living organisms.

He is an adjunct chemistry faculty member at the University of North Carolina at Chapel Hill working with Professor Michel Gagne in the department of chemistry. Previously, Dr. Lee was an adjunct faculty member at Duke University.

His work at the Army Research Office includes basic research directed towards hazardous management, including studies in decontamination, detection, and protection.

He has been awarded the Army's Greatest Invention twice for his work in the development of sensors. In addition, he was nominated for work in Nanoscale Materials FAST-ACT decontamination technology, for the Triosyn Reactive Respiratory Protection filter, and the ICx-Agentase Disclosure Spray. In 2008, Dr. Lee was awarded the Ten Outstanding Young Americans Award from the U.S. Jaycees and in 2011 a Meritorious Presidential Rank Award.

Originally from Starkville, Mississippi, Dr. Lee and his family live near Pittsboro, North Carolina. He is active with his two children and wife in the Cub Scouts of America as a den leader and enjoys kayaking, hiking, cross-country skiing and traveling.

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Research Interests

Tomasz Letowski is a senior research scientist in the ARL's Human Research and Engineering Directorate, where he conducts research in auditory perception and speech communication and their effects on Soldier performance.

The nature of modern warfare requires that Soldiers have hearing protection against hazardous noises, while at the same time being able to hear any changes in their surrounding environment and communicate through a radio network. These are very difficult conditions that affect both the sensory and cognitive performance of the Soldier. The main goal of Dr. Letowski's research is to help meet this challenge by providing both technical and operational solutions.

Dr. Letowski's work involves studies in auditory orientation in open and urban environments, auditory detection, effects of headgear and hearing protection devices on auditory awareness, non-traditional methods of radio interfacing including bone conduction and ultrasound, auditory skills development and Soldier performance in auditory virtual reality.

Dr. Letowski's research extends into studies of attention, mental load and the cognitive effects of multimodal communication. It combines laboratory experiments, field studies and modeling efforts that he hopes will lead to a better understanding of Soldier demands and resources, and provide effective technological and tactical aids enhancing auditory performance.

Biography

Dr. Letowski was born in Warsaw, Poland, and completed most of his education in Poland. After receiving a Master of Science degree in electronics from Warsaw Technical University in 1965, he worked as a research associate at the Medical Academy Hospital and the Chopin Academy of Music, both in Warsaw.

In 1971, he was awarded a three-month scholarship at the Institute of Perception in Eindhoven, the Netherlands. In 1973, he completed a Ph.D. in acoustics granted by Wroclaw Technical University, and from 1976 to 1977, he spent a year as a Fulbright Scholar at the University of Michigan.

Dr. Letowski returned to the United States in 1981 and worked through 1989 as a research associate and research professor in the Department of Audiology and Speech Pathology at the University of Tennessee in Knoxville.

In 1986, he earned a Doctor of Sciences degree in technical sciences from the Warsaw Technical University, and in 1987, a Special Award for Achievements in Acoustics from the Polish Academy of Sciences.

From 1989-1994, he worked as an associate professor of hearing sciences in the Communication Disorders Department at the Pennsylvania State University and taught several courses in sound quality at General Motors.

Dr. Letowski joined ARL in 1994 and was elected an ARL Fellow in 2000. In 2003, he was appointed Senior Research Scientist (ST) in the area of Soldier performance.

He is an adjunct professor in hearing sciences at Towson University and in industrial engineering at North Carolina Agricultural and Technological State University.

Since 1995, he has served as a scientific advisor to the National Research Council Associateship Program. In 1997, the Congress of the Republic of Poland awarded him a Professor Degree in environmental engineering.

He has published more than 200 papers and holds four patents. In 2009, he co-authored a hearing science textbook, *Hearing Science*, and was the editor and co-author of several chapters of *Helmet-Mounted Displays: Sensory, Perceptual and Cognitive Issues*.

In recent years, Dr. Letowski has been active in the international and national standardization communities. He is a member of several International Standards Organizations and International Electrotechnical Commission working groups, a chair or member of eight American National Standards Institute working groups, and a frequent U.S. representative to the International Electrotechnical Commission (IEC) and International Organization for Standardization (ISO) technical committee meetings. He also serves as the ARL's representative to the American National Standards Institute (ANSI) S3 and S12 technical committees.

Joseph Mait

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Research Interests

Joseph Mait's research interests include sensors and the application of optics, photonics and electromagnetics to sensing and sensor signal processing. His particular research areas include diffractive optic design, integrated computational imaging systems and signal processing.

Dr. Mait's early work on diffractive optics contributed to the development of new technology for shaping and deflecting light, and had broad impact on the optical design community.

For more than a decade, Dr. Mait has been working on computational imaging, a new approach to imaging system design that exploits advances in signal processing technology. This approach led to the development of an electro-optic system for ground vehicles capable of providing simultaneously focused images of close-in navigational hurdles and distant threats. He works with the federal funding agencies to develop and promote new imaging capabilities using computational imaging. For example, in 2008, the Defense Advanced Research Projects Agency's (DARPA) Mosaic Program demonstrated an infrared imager designed using computational imaging whose entire optics is less than five millimeters thick, yet its imaging performance matched that of a system of record that is four times as thick. He is currently involved with DARPA's Soldier Centric Imaging via Computational Cameras (SCENICC) program to use computational imaging techniques to provide Soldiers with enhanced imaging and display capabilities without increasing the power and weight burden to the Soldier

In 2005, ARL management asked Dr. Mait to develop and lead a new collaborative technology alliance on micro-autonomous systems, in effect, robotic platforms that can be held in a human palm. Leadership of this external research effort required Dr. Mait to apply both technical acumen and management lessons he learned observing his career officer father. After six years of successful leadership, Dr. Mait stepped down in 2011 to pursue full time the application of computational techniques to millimeter wave imaging.

Biography

As an Army brat, Dr. Mait experienced the Army from the ground up. He was six weeks old when he followed the Eighth Infantry Division and his father—a company commander—to Mannheim, Germany. Before turning 15, Dr. Mait moved an additional 10 times and finally put an end to his nomadic life by graduating high school at 16 in 1975.

He attended the University of Virginia, where he received his Bachelor of Science in electrical engineering in 1979. He went on to graduate work at the Georgia Institute of Technology, where he received his Master of Science, also in electrical engineering, in 1980, and a Ph.D. in 1985.

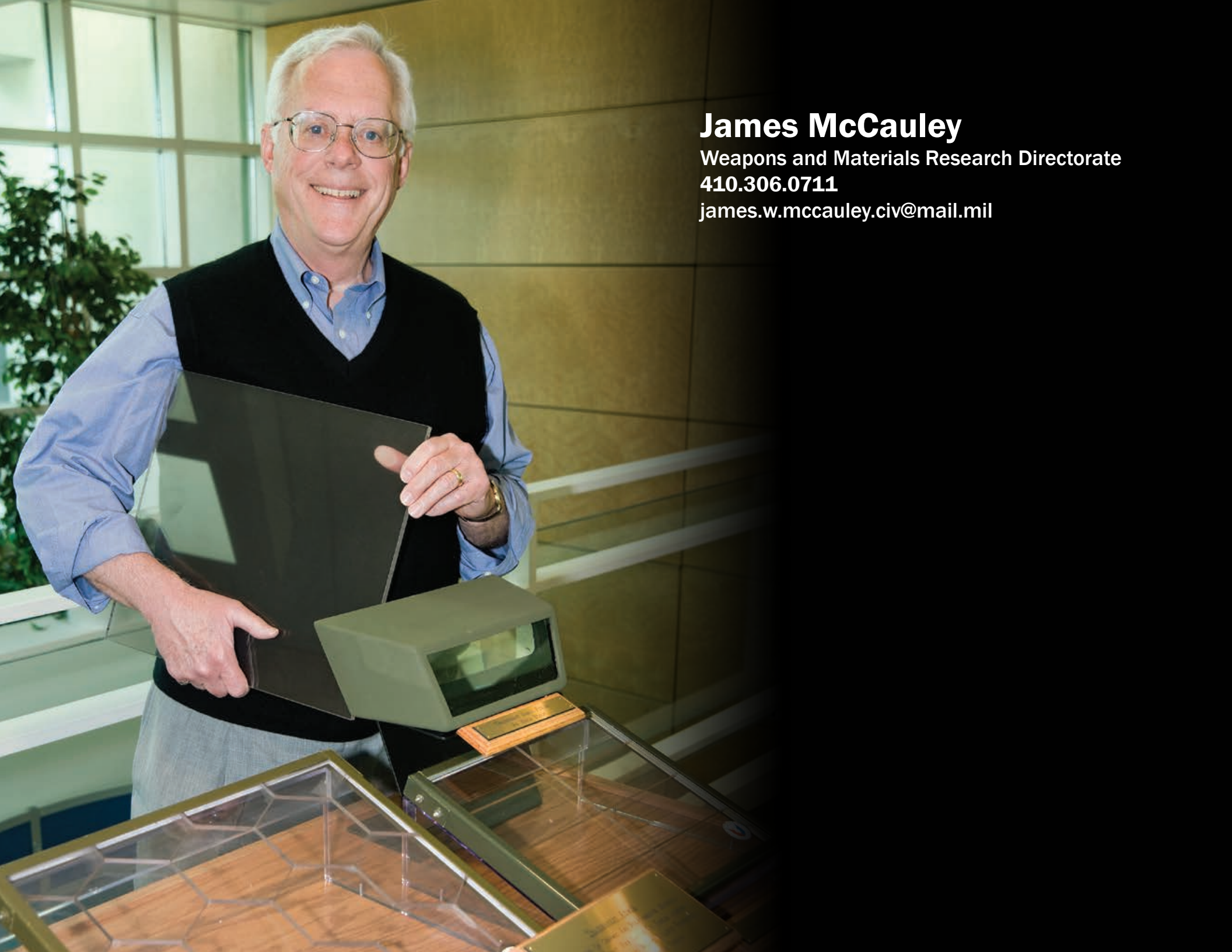
Since 1989, Dr. Mait has worked at ARL (formerly Harry Diamond Laboratories) and served in several different positions, including group leader for basic research in optics and Sensors Directorate Associate for Science and Technology. He is presently a senior technical researcher.

Dr. Mait's academic experience includes time as an assistant professor of electrical engineering at the University of Virginia and an adjunct associate professor at the University of Maryland, College Park. He has also held visiting positions at the Lehrstuhl für Angewandte Optik, Universität Erlangen-Nürnberg, Germany, and the Center for Technology and National Security Policy at the National Defense University, in Washington, DC.

He is a Fellow of the Optical Society of America and SPIE, an international society advancing an interdisciplinary approach to the science and application of light. He is a senior member of the Institute of Electrical and Electronics Engineers.

Since January 2009, Dr. Mait has been editor-in-chief of *Applied Optics*. He is also a member of the national honorary societies Sigma Xi, a society for scientific researchers; Tau Beta Pi, an engineering society; and Eta Kappa Nu, which honors excellence in electrical and computer engineering; and is a member of the Raven Society, the oldest honorary society at the University of Virginia.

Dr. Mait has been practicing yoga since 1992 and is devoted to his wife, two sons, daughter, son-in-law and grandson.



James McCauley

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Research Interests

James McCauley's research focuses on the dynamic behavior and optimization of advanced transparent and opaque armor ceramics for personnel and vehicle applications. His goal is to integrate processing, material characterization, dynamic mechanical testing and multi-scale modeling to determine and quantify the micro-mechanisms/physics of compressive dynamic deformation, damage accumulation and failure as influenced by defects and microstructure, and optimize these features for improved transparent and opaque armor ceramics. He has been advocating for a Materials by Design Approach for the last 15 years beginning with his leadership on the Armor Materials by Design Army Strategic Research Objective. Dr. McCauley is the inventor and name originator of and first to publish a model and patent a process for producing transparent Aluminum Oxynitride Spinel (AlON), a transparent armor and RADOME material. Over the last three years he has been actively involved with the initiation of the Collaborative Research Alliance in "Materials in Extreme Dynamic Environments" and the sponsor of the National Research Council Board of Army Science and Technology/National Materials Advisory Board committee on "Opportunities in Protection Materials Science and Technology for Future Army Applications."

He is the ARL's senior research engineer (ST) in ceramics (Chief Scientist in Materials), and cooperative agreement manager of the metals and ceramics Materials Centers of Excellence at Johns Hopkins, Rutgers and Pennsylvania State Universities.

Biography

Dr. McCauley earned his Bachelor of Science (cum laude) in geology from St. Joseph's College in Indiana in 1961, and his Master of Science in mineralogy in 1965 and Ph.D. in solid state science in 1968, both from The Pennsylvania State University. He also completed an Executive MBA program at Northeastern University in 1983.

From 1990 to 1996, he served as dean (SUNY Unit Head/President) and professor of ceramic engineering of the New York State College of Ceramics at Alfred University. He was employed at the Army Materials Technology Laboratory for 22 years, serving as founding chief of the Materials Characterization Division and Materials Science Branch, and as Liaison Scientist, Army Research Office, in Tokyo during 1988. He also was an adjunct professor at Boston University.

He is the author or co-author of 117 open literature publications, 57 government reports, presented 305 oral presentations, including many plenary presentations, the editor/co-editor of eight books, and holds five patents. His publications have been cited over 1,200 times. His recent book, where he was the senior editor, *Ceramic Armor Materials by Design*, has been printed twice.

Dr. McCauley has won many Army awards, including two Army Research and Development Achievement Awards; he co-authored the paper chosen as the best overall paper at the 25th Army Science Conference (Paul A. Siple award); and he won the fiscal year 2007 Senior Scientific-Professional (ST) Employee Presidential Rank Award, and an award from the Army's Small Business Innovative Research program office for his service as the technical area chief in Advanced Materials and Manufacturing. He has served on the Army Science Board, and on external review committees at Los Alamos National Laboratory and Drexel University. He was the founding chair of the DoD effort for five years to create a design allowable manual for Ceramic Matrix Composites. He is a Past Chair of the Army ST Corps and the ARL Fellows.

A Fellow and Distinguished Life Member (highest award in the Society) of the American Ceramic Society, he is a past chair and past trustee of the Engineering Ceramics Division, past trustee of the Ceramic Educational Council, past chair of the New England Section, a co-founder of the Cocoa Beach Conferences and a past vice president, and president of the Society. He was the co-founder of the *International Journal of Applied Ceramic Technology*.

Dr. McCauley is the winner of three American Ceramic Society awards and is an MRL Distinguished Alumni (1999), a centennial Fellow of the College of Earth and Mineral Sciences (1996), and just recently the 2011 Charles L. Hosler Alumni Scholar Medal, all at Penn State University. He has also been awarded the Prometheus Award, from the Japanese National Research Institute in Materials, in January 1990; and a medal from the Russian Academy of Sciences in October 2007, both for his work in Self-propagating High-temperature Synthesis (SHS).

He has been elected Academician of the World Academy of Ceramics and is a member of the National Institute of Ceramic Engineers, Materials Research Society, American Crystallographic Association, the Association of the U.S. Army, and Delta Epsilon Sigma, Phi Eta Sigma, Tau Beta Pi and Keramos honor societies.

Dr. McCauley has been married for more than 47 years and has three grown children, all with advanced degrees (two with Ph.D.s), and eight grandchildren. He spends his free time with his extended family, follows the Boston Red Sox and Celtics and collegiate athletics—Penn State University football and University of Maryland basketball—and reads and swims.

Nasser Nasrabadi

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Research Interests

Nasser Nasrabadi's main research interests have been focused on signal and image processing. Currently, he is working on hyperspectral image processing. Developing nonlinear image processing techniques using kernel-based learning theory has been his main research interest for the past few years. His recent research contributions have been on developing nonlinear matched filters and nonlinear joint detect, and fusion of multiple sensors.

His general research interests are sensor fusion, network sensor, statistical machine learning theory, visual surveillance and nonlinear kernel-based image processing.

Biography

Dr. Nasrabadi received his Bachelor of Science in engineering and Ph.D. degree in electrical engineering from Imperial College of Science and Technology / University of London, in 1980 and 1984, respectively.

From October 1984 to December 1984, he worked in the United Kingdom for IBM as a senior programmer. From 1985 to 1986, he worked with Philips Research Laboratory in New York as a member of their technical staff.

From 1986 to 1991, Dr. Nasrabadi was an assistant professor in the Department of Electrical Engineering at Worcester Polytechnic Institute in Massachusetts. From 1991 to 1996, he was an associate professor with the Department of Electrical and Computer Engineering at State University of New York at Buffalo, New York. In September 1996, he joined ARL as a research scientist, and in October 2000, he became a senior research scientist for image and signal processing.

He served as an associate editor from 1993 to 1996 for the Institute of Electrical and Electronics Engineers' (IEEE) *Transactions on Image Processing*, from 1996 to 1999 on IEEE's *Transactions on Circuits and Systems and Video Technology*, and from 1998 to 2002 on their *Transactions on Neural Networks*.

Dr. Nasrabadi has been guest editor for two special issues of the IEEE *Transactions on Image Processing* titled *Vector Quantization and Applications of Artificial Neural Networks in Image Processing* in 1996 and 1998, respectively.

He has been the conference chair of the International Society for Optical Engineering (SPIE) Symposium on Applications of Neural Networks in Image Processing, from 1995-present; served as a member of technical committee for numerous SPIE and IEEE international conferences; and guided 13 Ph.D. dissertations and nine master's theses, and supervised a number of ARL post-docs.

He has received the Blumlein-Browne-Williams Premium, and the A. H. Reeves Premium of the IEEE Electronics Division in 1992; best paper award for the Proceedings of the IEEE Symposium on Image, Speech and Natural Language Systems in 1996; and received an ARL Excellence in Technical Publication Award in 1997.

Dr. Nasrabadi is a Fellow of both the IEEE and SPIE.

Rose Pesce-Rodriguez

Weapons and Materials Research Directorate

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Research Interests

Rose Pesce-Rodriguez's scientific research is focused on understanding the complex chemical processes which occur within energetic materials, propellants, and the constituents of their formulations. Her technical expertise is in the wide area of research in Analytical Chemistry and Chemical Analysis with specialized focus on the chemistry of energetic materials that include explosives and propellants as related to the chemistry of their stability, aging, compatibility, performance and physical properties. Her favorite techniques include chromatography and mass spectroscopy (alone or in combination). Her recent research is focused on the characterization of high-nitrogen compounds for use as explosive and propellant ingredients. She loves the challenge of solving complex problems and resolving chemical-related issues of importance to the Army (including red team investigations, reverse engineering and mechanistic studies).

Biography

Dr. Pesce-Rodriguez received both her Bachelor of Arts and Ph.D. from the City University of New York. The bachelor's degree was awarded by Queens College in 1984 with a double major in Chemistry and Russian. The doctorate was awarded by the University Graduate Center in 1988 in Chemistry (Polymer sub-discipline).

Dr. Pesce-Rodriguez was hired by the Ballistic Research Laboratory in 1990 after serving approximately 1.5 years as a National Research Council Postdoctoral Fellow under ARL Fellow Dr. Robert Fifer (deceased). She has served as the leader of the Advanced Energetic Materials Team since 1994. Other employment includes one year at Forest Laboratories as an analytical chemist investigating kinetics of controlled-released prescription medications, and one year as an associate professor of Chemistry at the College of Staten Island, where Dr. Pesce-Rodriguez taught General Chemistry to undergraduates and Instrumental Analysis to masters-level students. During that same period, Dr. Pesce-Rodriguez also served as a consultant to Hoechst-Celanese in the area of polyacetal engineering resins (the topic of her doctoral research).

In addition to Dr. Pesce-Rodriguez's scientific service to ARL, she has also served on many panels and committees. She served as the Chair of the Diversity Advisory Board from January 2007 through January 2009, as the Vice Chair from January 2006 through 2007, and as the Weapons and Materials Research Directorate (WMRD) representative from January 2004 through January 2006. Rose has served on many REDS panels and has been the WMRD Postdoctoral Program Representative since 2004. She serves as a subject matter expert in Chemistry for the Aberdeen Proving Ground (APG) Emergency Response Team, and is often called to service by ARL Risk management Office in chemistry-related matters. Dr. Pesce-Rodriguez has been part of many red teams and accident investigations over the years.

She was the recipient of many awards, including the Federal Executive Board (FEB) Silver Medal, Outstanding Professional (Technical/Scientific) in 2000; the FEB Silver Award for Community Service in 2006; and the FEB/Federal Women's Program "Woman of the Year" in 2004. Dr. Pesce-Rodriguez has received three ARL Honorary Awards: the ARL Honorary Award for Community Service in 2003 and 2006, and the ARL Honorary Award for Diversity in 2008.

Rose has been awarded five patents, and has published 28 open-literature papers, one invited book chapter and 70 technical reports. She had given 80 conference presentations and hundreds of presentations as part of her educational outreach activities.

Dr. Pesce-Rodriguez is very involved with educational outreach and is involved in several programs that provide hands-on chemistry to elementary through high school aged children (and sometime their parents). The main programs are National Chemistry Week, Chemistry-in-the-Library (which she conducts on Saturdays), and Gains in Math and Science (GEMS). She has also participated in the Army's eCYBERMISSION program, as an Ambassador, and the Materials World Modules (MWM) program. She is frequently sought out for service as a career day presenter and science fair judge.

Dr. Pesce-Rodriguez has been married for 23 years and has two young children, a daughter and a son. She enjoys swimming, traveling and studying foreign languages.

Peter Reynolds

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Research Interests

Peter Reynolds has a research background in physics and chemistry theory.

His interest in statistical mechanics, particularly phase transitions and critical phenomena, led to exploring model Hamiltonians such as Ising, Potts and Heisenberg. His studies on the effects of disorder led to exploring percolation as a model of pure disorder.

A key insight of his was that pure percolation, which requires no Hamiltonian, can nevertheless be rigorously mapped onto a thermodynamic formalism. Moreover, it could be treated by renormalization group methods, allowing the extraction of critical behavior.

Beyond mapping phases and phase boundaries in various percolation models, Dr. Reynolds' work enabled quick and reasonable estimates of critical exponents, far better than mean field. To improve calculation of exponents, he invented a hybrid: Monte Carlo renormalization group, which was simpler and more systematic.

Dr. Reynolds then applied the insights and methods developed for percolation to other similarly, "purely statistical," statistical mechanical problems, such as lattice animals and self-avoiding walk models of polymers.

While these problems are classical, the quantum analogs piqued his interest: Anderson localization as a quantum percolation problem, and Bose-Einstein condensation, where quantum statistics drive the transition.

These model systems embody the key physics of phase transitions. However, "reality" is governed by quantum mechanics. So Dr. Reynolds turned to applying Monte Carlo methods to the Schrodinger equation. He proceeded to do the first quantum chemical calculations by "Diffusion Monte Carlo." He subsequently summarized the state-of-the-art that he and his colleagues had achieved in a 1992 monograph.

After becoming an Office of Naval Research program manager, his interests shifted to atomic and molecular physics, emphasizing cooling and trapping atoms and ions, and coherent control of molecules (with applications to atomic clocks, inertial navigation and sensors).

Dr. Reynolds' program was the first to demonstrate a "qubit." Connecting to his earlier interest in purely "statistical" transitions, he developed a thrust to see if one could achieve Bose-Einstein condensation (BEC) in laser cooled and trapped atoms. In 1995, his program succeeded, with two groups he had set in competition achieving BEC within months of each other.

This has evolved in directions including atom lasers, novel phases of degenerate Fermi gases, and optical lattice "emulators" involving the "design" of specific Hamiltonians to experimentally "simulate" intractable statistical mechanics models. Of particular interest is the Hubbard model, for its connection to high temperature superconductivity, and disordered magnetic models, to study quantum spin liquids. Disorder and phase transitions induced purely by statistics…we see early themes returning in new forms.

Biography

Born and raised in New York City, Dr. Reynolds graduated from the famed Bronx High School of Science. From there he went to the University of California at Berkeley, to take the still developing "Berkeley Physics Course." He completed the physics honors program "with great distinction," was a Regents Scholar, was inducted into Phi Beta Kappa, and was awarded the physics department Citation (for best student). He then attended MIT to study statistical physics. He was both an NSF and an IBM pre-doctoral Fellow. In 1979, Dr. Reynolds earned a Ph.D. for research in critical phenomena in disordered systems. After a stint as an assistant research professor at Boston University, he became a staff scientist in 1980 at Lawrence Berkeley Laboratory, where his interests shifted to quantum simulations.

From 1988 to 2003, Dr. Reynolds was an Office of Naval Research (ONR) program officer in atomic and molecular physics. His program led to the current excitement in ultracold-atom physics, including BEC. He was also the Navy Principal to the DoD High Performance Computing Modernization Program, serving as the Navy's science and technology advisor.

He has held visiting appointments worldwide, including at Japan's NEC Fundamental Research Laboratories; UC-Berkeley; the Institute for Theoretical Physics at UC-Santa Barbara; and Italy's Università dell'Insubria.

In 2003, Dr. Reynolds joined ARO, where he has been Associate Director in the Physical Sciences Directorate and Physics Division Chief prior to assuming his current position as Senior Research Scientist.

He has served on the editorial board of the *American Journal of Physics*. His biography is in *Who's Who in America, Who's Who in the World, Who's Who in Science and Technology*, and *American Men and Women of Science*. He is a Fellow of the American Physical Society.

Dr. Reynolds' publications have been cited more than 3,500 times.

Betsy Rice

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Research Interests

Betsy Rice's research is focused on determining microscopic details of the physical and chemical processes of materials of interest to the Army, including energetic materials, chemical agents and materials related to armor/armaments through the use of atomistic simulation. Dr. Rice's expertise lies in the theoretical chemistry area of classical molecular simulation and quantum mechanical characterization.

These simulations allow atomic-scale examination of material's response to various stimuli, such as thermal or shock initiation of an energetic or reactive material, resulting in chemical reaction. Such insight leads to better understanding of the fundamental mechanisms that control conversion of a material in a chemical reaction, which can then be exploited to design materials, chemicals, or experiments that will subsequently alter or control chemical behavior or material response. With ever-increasing advances in computational methods and platforms, Dr. Rice has expanded her research into multiscale reactive modeling of materials.

Additionally, Dr. Rice has transitioned standard theoretical chemical methodologies into practical predictive tools. She has developed a computational chemistry toolkit for energetic materials design that is used to screen candidate materials before attempting synthesis. The toolkit consists of a suite of software to predict properties that are related to performance, vulnerability and environmental hazards of the materials. The development of these tools has eliminated waste streams associated with synthesis and testing for probable poor performers, thus allowing valuable time and resources to be expended on the most promising materials.

In maintaining and augmenting the toolkit, Dr. Rice evaluates emerging atomistic simulation methodologies and software developed by DoD-supported academicians for energetic materials research. She identifies deficiencies in these methods and models, recommends improvements, or incorporates suitable software into the toolkit for use by the DoD computational chemistry and materials research community.

Biography

Dr. Rice began her career with the Army as a National Research Council Postdoctoral Fellow at the Ballistic Research Laboratory in 1989, and was subsequently hired by ARL in 1990, where she acts as the Leader of the Multiscale Reactive Modeling Team.

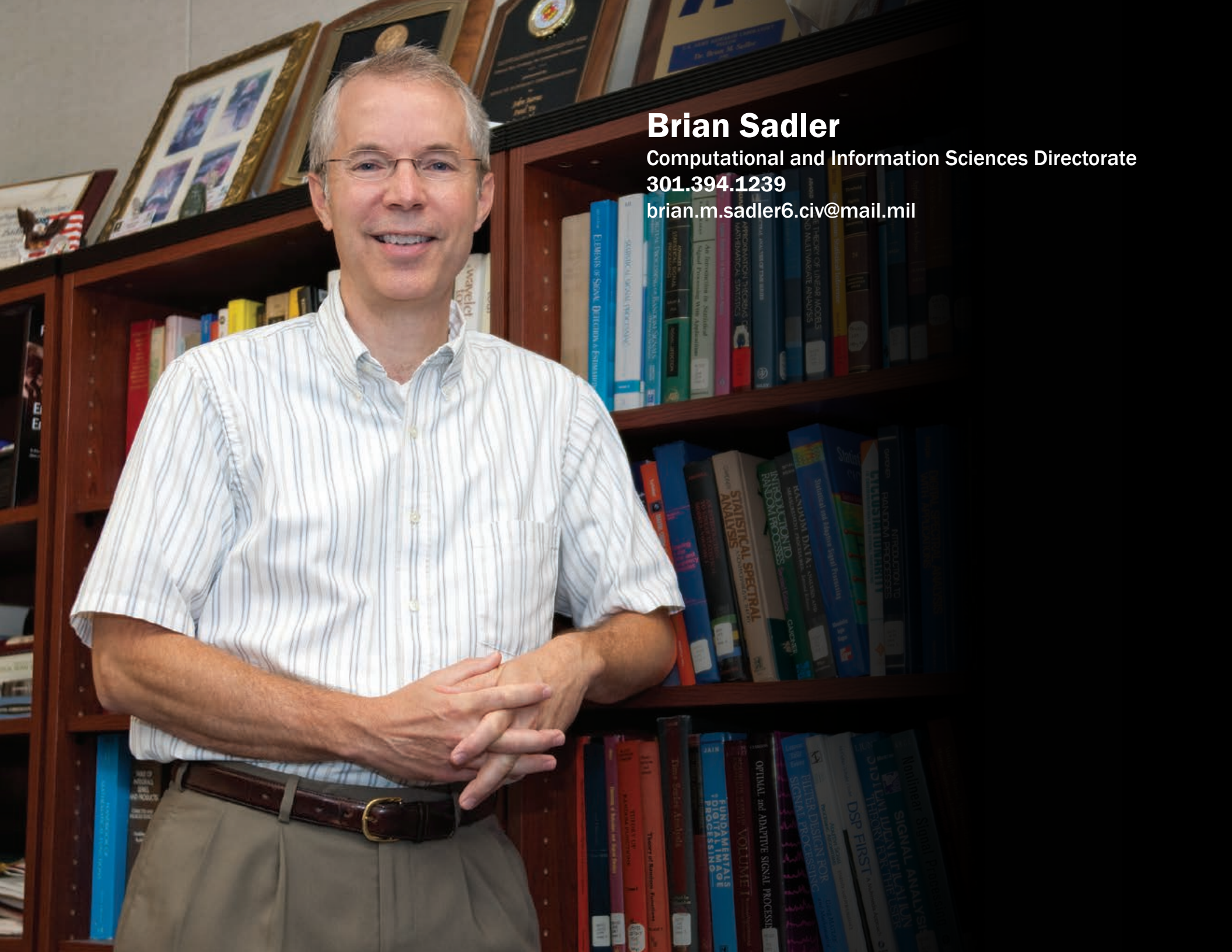
She earned a Bachelor of Science in chemistry from Cameron University in Oklahoma in 1984, and was awarded a Ph.D. in chemistry at Oklahoma State University in 1987. She held a postdoctoral position in 1988 with Chemical Dynamics Corporation before joining the Army research community.

Dr. Rice has authored more than 80 open literature publications in chemical physics journals. She has also written nine invited book chapters on molecular simulations of energetic materials.

She was the recipient of the 1999 and 2007 ARL Award for Publication, both of which detail her activities to predict properties of energetic materials related to their performance in weapons systems or their sensitivity to shock impact. She was also awarded the 1997, 2003 and 2008 Army Research and Development Achievement Awards for molecular simulations of energetic materials. In 2006, her paper *Theoretical Chemical Characterization of Energetic Materials* was named as the Outstanding Meeting Paper for the 2005 Materials Research Society Fall Meeting Symposium H (Multifunctional Energetic Materials) Proceedings.

She also has been involved in several High Performance Computing Modernization Program (HPCMP) Common High Performance Computing Software Support Initiative (CHSSI) projects, awarded to develop scalable high-performance software for DoD applications. She also participates in an HPCMP Challenge project, in which high priority computational time on HPCMP shared resources is awarded to investigators who require large-scale calculations of data of critical importance to DoD. She also holds the position of Senior Scientist at the High Performance Computing Software Application Institute for Reactive Multi-scale Modeling of Insensitive Munitions, awarded in 2008.

Additionally, Dr. Rice is ARL's Activity Allocation Officer, a corporate position in which she establishes priorities for allocating ARL's computational resources to individual projects, and ensures that allocations are appropriately distributed and available to the workforce. In 2007, she was appointed the primary Service/Agency Approval Authority for the Army Research Office and is the alternate for ARL. In this position, she assists and sponsors ARO-supported academics in developing their proposals and establishes allocations and accounts on HPCMP resources.



Brian Sadler

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Research Interests

Brian Sadler's research interests include sensing, communications, signal processing, and control, with application to mobile wireless networked and autonomous systems.. He has made fundamental contributions in information science, estimation theory, networked and multichannel systems, acoustics, optics and mixed-signal integrated circuit architectures. His work includes basic and applied research, with an emphasis on fundamental analysis, as well as experimental efforts and implementation in fielded systems.

Biography

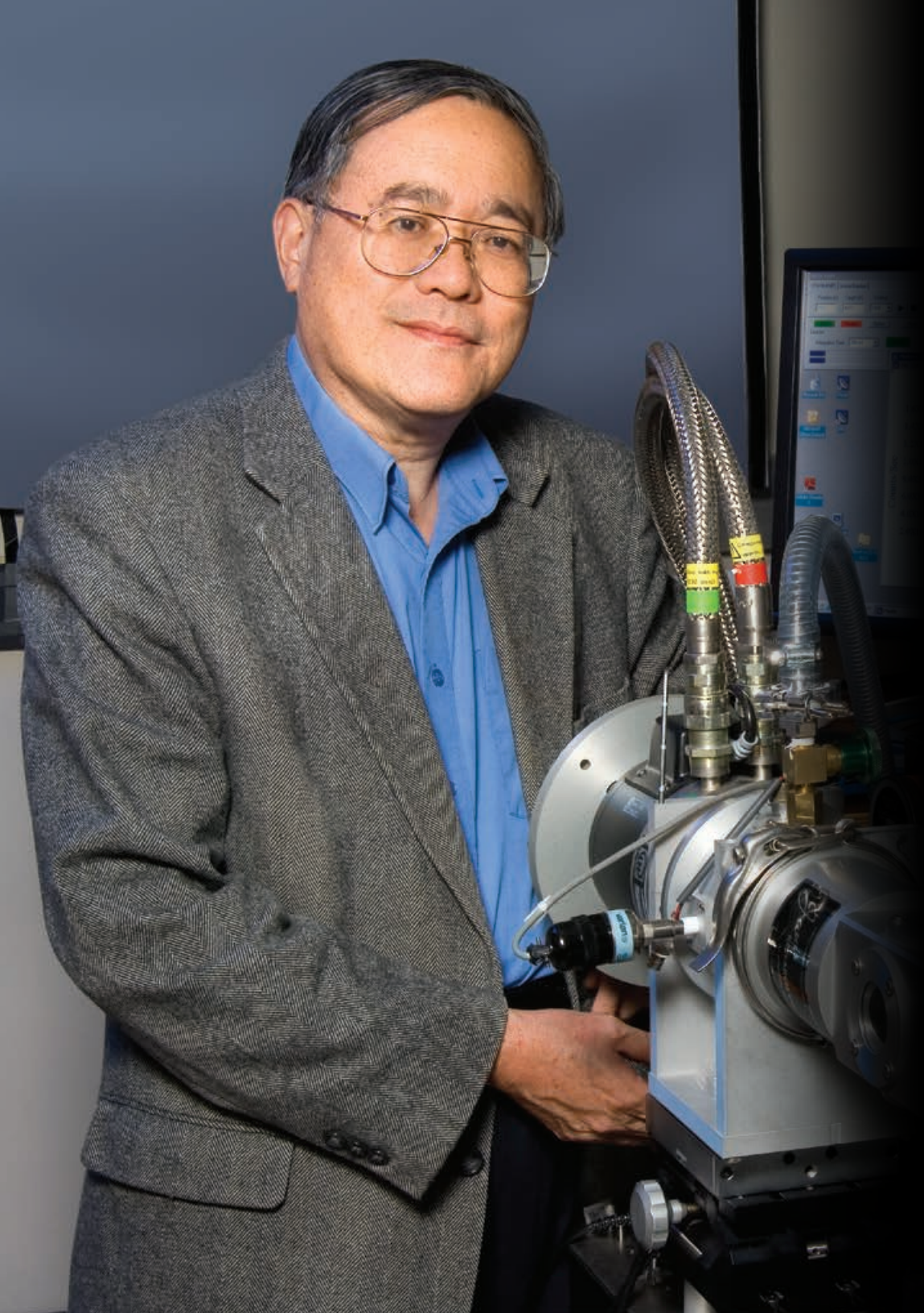
Brian M. Sadler received his Bachelor of Science and Master of Science degrees from the University of Maryland, College Park, and his Ph.D. from the University of Virginia, Charlottesville, all in electrical engineering.

Dr. Sadler is broadly engaged in collaborative research, research management and government consulting, and he has directed several projects via the Small Business Innovation Research (SBIR) program. He has been active in several ARL Collaborative Technology Alliances (CTAs), and is a technical area lead in the Micro Autonomous Systems and Technology CTA. He has participated in many Defense Advanced Research Projects Agency (DARPA) programs and projects, and consulted a variety of government organizations. He has lectured at the University of Maryland, and lectured at Johns Hopkins University for 15 years.

Dr. Sadler is active in conference and workshop organization and planning, as well as Institute of Electrical and Electronics Engineers (IEEE) technical committees. He co-chaired the 2nd IEEE Workshop on Signal Processing Advances in Wireless Communications, and has organized many sessions and panels in various venues. He has been an associate editor for several journals, including the *IEEE Transactions on Signal Processing* and *IEEE SP Letters*. He has also been a guest editor for several special issues, including the *IEEE Journal on Selected Areas in Communications* and the *IEEE Signal Processing Magazine*. He was lead guest editor for the *IEEE Transactions on Special Topics in Signal Processing* special issue on ultra-wideband systems, and the *International Journal of Robotics Research* special issue on robotic communications and collaboration in complex environments.

Dr. Sadler received the IEEE Signal Processing Society Best Paper Award twice, the ARL Award for Science, a University of Maryland Invention of the Year Award, three Army Research and Development Achievement awards, an Army SBIR Phase II Quality award, and two Army Science Conference Paper awards. He has mentored many students, and has served on 15 Ph.D. committees in the United States and Europe. He has co-authored more than 300 publications and several patents. He is also a Fellow of the IEEE.

Brian enjoys family activities with his wife and two daughters, and is an avid drummer who performs regularly.



Paul Shen

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Research Interests

Paul Shen is internationally known for his pioneering work on modulation spectroscopy on semiconductor, especially for his contribution to the development of photoreflectance for semiconductor material and heterostructure characterization. These include the theory of photoreflectance, the theory of Franze-Keldysh oscillations in modulation spectroscopy and instrumentation for modulation spectroscopy.

His principal research interests are in the study of the electronic and optical properties of semiconductor materials and the development of novel semiconductor optoelectronic devices, including ultra-high contrast, ultra-fast spatial light modulators, polarization sensitive and insensitive OE modulators, low threshold semiconductor vertical cavity lasers and microwave frequency OE mixers.

In his recent research, Dr. Shen has focused on the area of GaN-based wide band gap semiconductor material and UV optoelectronic devices, including high efficient UV light emitting diode at solar blind wavelength, UV semiconductor lasers, and UV avalanche detectors.

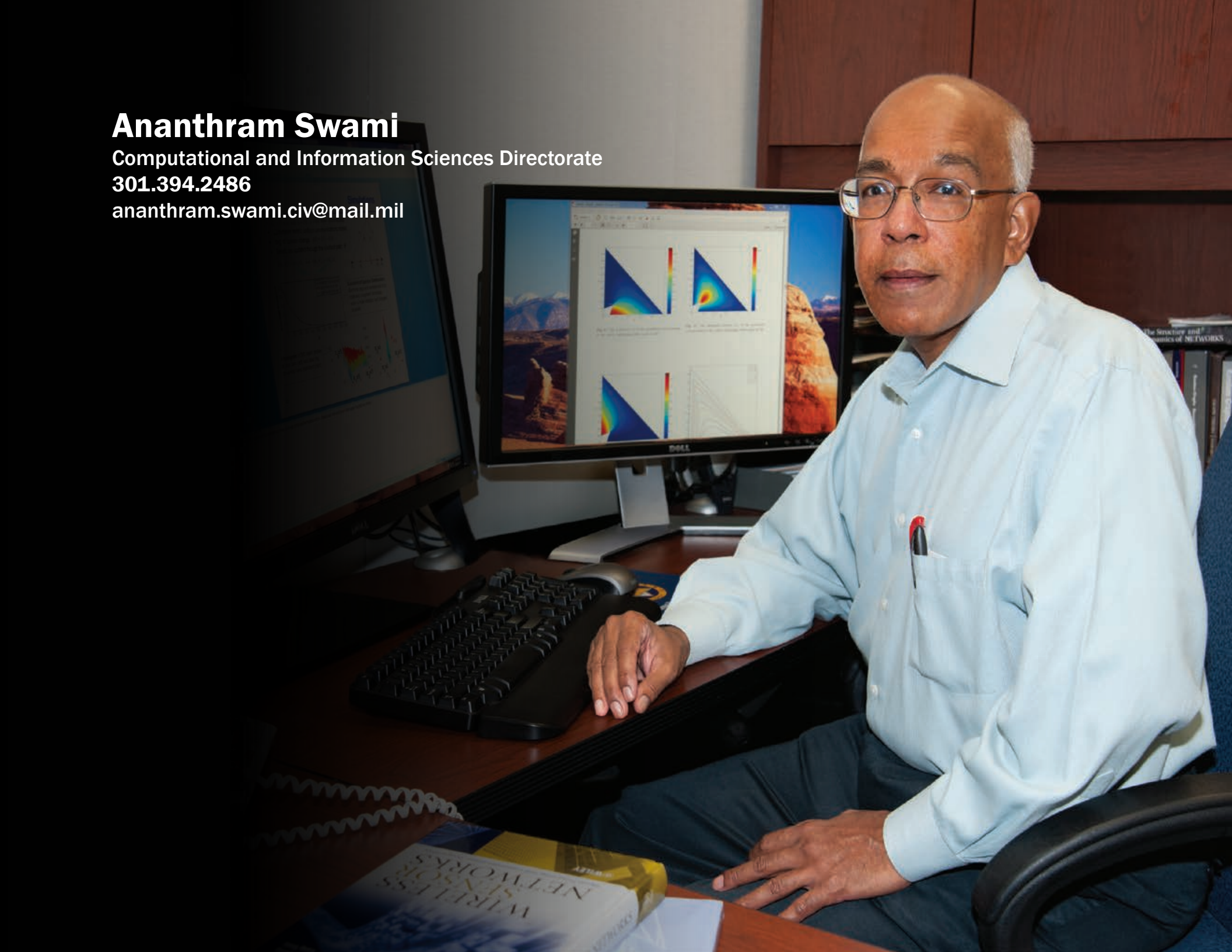
Biography

Dr. Shen received a Bachelor of Science degree in nuclear physics from Shanghai Fudan University, a Master of Science degree in applied physics from Shanghai Jiaoton University, and a Ph.D. in solid state physics from the City University of New York. Following three years of postdoctoral research, he joined the GEO Centers Inc., and then the U.S. Army Electronics Technology and Devices Laboratory, which later became part of ARL. Currently, he is a senior scientist at Sensors and Electron Devices Directorate of ARL. He is also an adjunct professor at Rutgers University and at University of Illinois.

He has authored and co-authored more than 260 refereed journal papers. He is the author on the topic of Quantum Wells in *Encyclopedia of Materials Science and Engineering, Supplementary* and in *Concise Encyclopedia of Semiconducting Materials and Related Technologies;* and a co-author on the topic of Optical Waveguide Components in *Wiley Encyclopedia of Electrical and Electronic Engineering.* Dr. Shen's publications have been cited more than 5,500 times with an h-factor of 33 and five papers have more than 220 citations each. He has been awarded 33 U.S. patents, with four licensed to industry.

Dr. Shen received Department of Army Research and Development Achievement Awards in 1992, 1992, 1995, 1997 and 2002, the Army Science Conference Paul A. Siple (first place) Award in 1994, and the Meritorious Presidential Rank Award in 2010.

Dr. Shen is also a Fellow of Optical Society of America.



Ananthram Swami

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Research Interests

Ananthram Swami's research interests are in the broad area of network science, the study of interactions and co-evolution, prediction and control of inter-dependent networks, with applications including mobile ad hoc wireless networks, sensor networks, and hybrid networks.

Biography

Ananthram Swami received the B.Tech. degree from IIT-Bombay, a Master of Science degree from Rice University and a Ph.D. degree from the University of Southern California, all in electrical engineering. Before joining ARL, he held research positions with Unocal Corporation, USC, CS-3 and Malgudi Systems. He was a statistical consultant to the California Lottery, developed a MATLAB-based toolbox for non-Gaussian signal processing, and has held visiting faculty positions at Institut National Polytechnique, Toulouse, France.

Dr. Swami has published more than 300 journal and conference papers in the area of signal processing, communication networks, and network science, holds three patents, and has co-led multiple tutorials on cognitive networking. He is a government lead in ARL's Collaborative Technology Alliance on Network Science, and in the International Technology Alliance in Network and Information Sciences, and has served as consultant to several DARPA programs. His research is currently supported by DTRA and OSD.

Dr. Swami was a member of the Institute of Electronics and Electrical Engineers (IEEE) Signal Processing Society's Board of Governors, and has served on the Editorial Boards of the *IEEE Transactions on Wireless Communications*, the *IEEE Transactions on Signal Processing*, *IEEE Signal Processing Letters*, *IEEE Transactions on Circuits & Systems-II*, and *IEEE Signal Processing Magazine*. He has co-organized four workshops, most recently IEEE SPAWC 2010. He has guest edited multiple special issues of the *IEEE Signal Processing Magazine* on Signal Processing, EURASIP signal processing journals, IEEE JSAC and IEEE JSTSP; including most recently a special issue of IEEE JSAC on Advances in Military Networking and Communications and an upcoming special issue of JSAC on Network Science.

Dr. Swami has served on 18 Ph.D. dissertation committees in the U.S., Europe, and Australia. He has taught short courses for industry, as well as courses on statistical signal processing and communications theory at the University of Maryland. He received an Army Research and Development Achievement Award for work on signal classification, a Small Business Innovation Research (SBIR) Phase 2 Quality Award, an Excellence in Federal Career Award, and an ARL Award for Science. He is co-recipient of a Best Conference Paper award at IEEE TrustCom 2009, Best Conference Paper finalist at ICCRTS 2010 and ICCRTS 2009; and senior co-author of three Student Best Paper awards.

He is also a Fellow of the IEEE and is the Army's Senior Research Scientist (ST) for Network Science.

Don Torrieri

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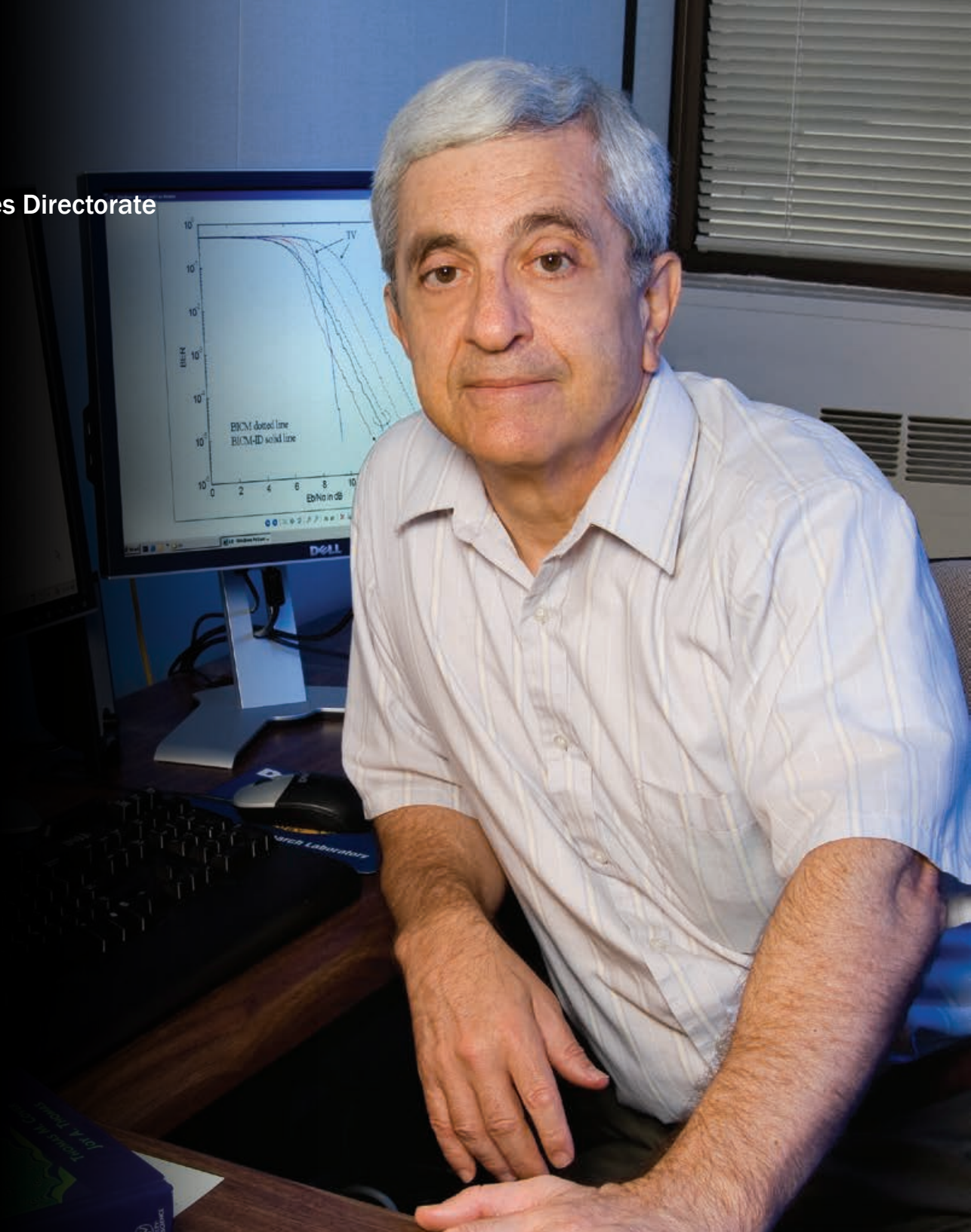

Research Interests

Don Torrieri is an Army research engineer with primary interests in wireless communication systems, spread spectrum, adaptive arrays and signal processing.

At present, he is actively involved in several research and development projects. One is the development and testing of an advanced adaptive array and spread-spectrum system that he designed. The array outputs are applied to an algorithm that enables the receiver to suppress interference or jamming at levels far larger than those that currently are tolerable. Another project is the accurate evaluation of outage probabilities and transmission capacities in spread-spectrum ad hoc networks by using new analytical methods that do not rely on the conventional assumptions of stochastic geometry. Another project is the development of new techniques for cyber maneuver, which entails the design of a moving-target defense against infringements of cyber security.

Biography

Dr. Torrieri received a Ph.D. in electrical engineering from the University of Maryland. He previously received a Master of Science degree in physics from the University of Maryland, a Master of Science degree in electrophysics from the Polytechnic University, and a Bachelor of Science degree in electrical engineering from the Massachusetts Institute of Technology.

He analyzed electronic systems at the Naval Research Laboratory, where he received three Group Achievement awards and three Research Publication awards. Since 1977, he has worked for the Department of the Army.

Dr. Torrieri spent sixteen years doing classified work for the Survivability Management Office and its predecessors. His primary responsibility was to assess the survivability of Army communication and electronic warfare systems and to develop counter-countermeasures and system enhancements. This work entailed extensive mathematical analyses in the areas of interference and jamming suppression, modulation, error-correcting codes, direct-sequence systems, frequency-hopping systems, adaptive arrays, interception, direction finding and geolocation. These analyses were subsumed into several Army computer models of battlefield communications. Dr. Torrieri developed new analytical tools to assist the program managers of the Mobile Subscriber Equipment program, Enhanced Position Location Reporting System and Joint Tactical Information Distribution System in their assessments of the survivability and effectiveness of message routing algorithms. He directed the survivability enhancement analysis of a short-range unmanned air vehicle that resulted in the publication of several studies of its survivability and performance. He provided specific guidance to Army personnel, assisting them in assessing threats such as the potential deception of the Patriot missile communications and the repeater jamming of the Single Channel Ground and Airborne Radar System. He wrote many blue-ribbon committee and red-team reports on Army communication systems.

Dr. Torrieri was a contributor to the design and development of a mine-detection system. He served for three years as a factor leader in the Collaborative Technology Alliances. He contributed to the design of an indoor geolocation system based on a dead-reckoning inertial navigation device that will enable a squad leader to track the movement of a Soldier in a building or subterranean structure. The system is rapidly deployable, reliable, and low-cost without relying on pre-installed infrastructure, external assets, or environmental information. Dr. Torrieri also contributed to the theories of network coding and iterative channel estimation.

He is the author of *Principles of Spread-Spectrum Communication Systems* (second edition, 2011, and first edition, 2005); *Principles of Secure Communications Systems* (second edition, 1992, and first edition, 1985); *Principles of Military Communication Systems* (1981); and chapter one of *Acousto-Optic Signal Processing Theory and Implementation* (second edition, 1995, and first edition, 1983).

Dr. Torrieri has written many journal articles, conference papers, technical reports and classified reports. He has taught many graduate courses at both Johns Hopkins University and George Washington University, and has taught many short courses. His awards include the Military Communications Technical Achievement Award and the Best Paper Award of the Institute of Electrical and Electronics Engineers Military Communications Conference. In 1989, Dr. Torrieri was selected as one of the original fellows of the Army Laboratory Command, predecessor to the Army Research Laboratory.

He is married, has two adult children, and is active in community life. He has coached more than 20 county athletic teams for boys and girls. Dr. Torrieri is an enthusiastic softball player who plays throughout the year.

Gorden Videen

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Research Interests

Gorden Videen's research has focused on determining the light-scattering properties of irregularly shaped aerosols. His early investigations were stimulated by the need to understand image degradation due to contamination and micro-fissures on space optics. He continued his research in atmospheric optics, studying the effect of water droplet nuclei on cloud absorption. This work also was instrumental in determining the location of nucleating agents within water droplets. This is an important problem in atmospheric chemistry, since nucleating agents located on droplet edges are exposed to air and tend to undergo much more rapid chemical reactions. Currently, he is studying the effect of aggregation on the back-scattered light and its use as a discriminator for detector systems.

With colleagues, he has modified T-matrix methods, one of the most widely used method for calculating light scattering by non-spherical aerosol particles. The newly developed Sh-matrix allows for the rapid calculation of light-scattering properties from a polydispersion of particles of different size and refractive index and illuminated at different wavelengths, much more rapidly than the traditional T-matrix methods.

Such a technique is extremely valuable to the remote-sensing/LIDAR communities, which need large look-up tables of such properties to interpret their data. This Sh-matrix theory has been expanded in the last few years, and Dr. Videen and colleagues have been able to use it to derive analytical solutions for the light-scattering from particles having complicated geometries, like Chebyshev particles, bi-spheres and capsules, lenses, finite cylinders, and even corrugated finite cylinders, capsules, and even an arbitrary particle.

He has studied light-scattering properties of surfaces since 1991, when he formulated a technique and derived an analytical solution for the scattering by the most fundamental microstructure, a sphere located on or near a planar interface. Dr. Videen has published over a dozen manuscripts and two book chapters on the scattering from structures on surfaces. He currently is developing and using numerical (Discrete Dipole Approximation and Finite-Difference Time-Domain) algorithms to calculate the light scattered by arbitrarily shaped structures on substrates.

During the 2003 opposition of Mars, Dr. Videen was a member of the research team that used the Hubble Space Telescope to map the surface polarization of Mars as a function of phase angle. During this study, thin clouds were discovered preceding a dust storm that could only be visualized using polarization techniques. The polarization phenomenon under investigation was the Polarization Opposition Effect (POE) that is commonly seen in planetary remote-sensing studies. Dr. Videen extended this research to terrestrial aerosols and showed that it is feasible to distinguish clouds containing potential biological-warfare agent spores from clouds of dust or water particles.

Biography

Gorden Videen received his Ph.D. in optics at the University of Arizona in 1992, studying rough surfaces and contaminants on mirrors using light scattering. He spent nearly three years researching atmospheric aerosols in postdoctoral research at Dalhousie University, followed by two more years developing aerosol detection techniques at White Sands Missile Range, New Mexico, as a National Research Council (NRC) postdoctoral fellow, and at New Mexico State University, where he was also a faculty member.

He was hired as a physicist at the ARL in 1997 and was a co-recipient of the ARL Science Award that year. He has developed unique theories to calculate the scattering from irregular particle systems—e.g., particles on substrates, aggregate particles and cellular systems. He currently is working on detection methodologies of atmospheric threat aerosols using elastic light scattering.

Dr. Videen has published over 150 peer-reviewed manuscripts with over 120 collaborators in scientific journals dealing with experimental, theoretical and computational aspects of light scattering. He also has edited 11 books, contributed 14 book chapters, and has co-chaired eight international conferences and workshops. From 2005 to 2007, he undertook a sabbatical at the University of Amsterdam Astronomy Department, where he developed efficient algorithms to calculate light scattering from irregular particles.

Dr. Videen and his wife Erin have two daughters, Scotia and Paisley. As hobbies, he enjoys performing remote-sensing studies of asteroids, comets and lunar regolith, in addition to brewing beer, cider and mead. He and Erin are active members of the BBQ Brethren and have won numerous BBQ throwdowns.

Bruce J. West
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Research Interests

Bruce J. West is Chief Scientist Mathematics (ST) of the U.S. Army Research Office, Information Science Directorate, from 1999 to the present.

His research focus has been on the development of the mathematical tools necessary to understand complex phenomena as they apply to the nascent discipline of Network Science. He has led the development of the ARL External Nonlinear Science program starting in 2006. His work on the fractional calculus for the modeling of complex phenomena lead to *Physics of Fractal Operators* (with M. Bologna and P. Grigolini, Springer, 2003) for which he received the ARL Award for Publication in 2003. This book explains the importance of the fractional calculus in modeling nonlinear complex dynamical networks in both the physical and life sciences.

In studying complex networks, Dr. West has pursued research in physiology and the modeling of nonlinear biomedical phenomena leading to the text *Biodynamics: Why the Wirewalker Doesn't Fall* (with L. Griffin, Wiley & Sons, 2004). His research has provided new measures for the detection and assessment of injury, disease, and other physiologic pathologies of significance to the Soldier. These measures include the assessment of the level of injury in head trauma, the detection of abnormalities in the cardiovascular network and in the motor control network for human locomotion, the detection of micro-seizures during sleep, and quantitative indicators of a Soldier's general state of health. These measures are laid out in a pedagogic manner in the book *Where Medicine Went Wrong* (World Scientific, 2006) written for a lay audience.

His research on Network Science led to two additional books: *Disrupted Networks* in 2010 with N. Scafetta provides a lens through which modern society is shown to depend on complex networks for its stability; and *Complex Networks* in 2011 with P. Grigolini which synthesizes modern mathematical developments with a broad range of applications of interest to the engineer and system scientist, presenting the common principles, algorithms and tools governing network behavior, dynamics and complexity.

Biography

Dr. West graduated with a Ph.D. in nuclear physics from the University of Rochester in 1970, after which he was a post-doctoral researcher for two years before becoming the first full-time employee of Physical Dynamics Inc., a for-profit employee-owned research and development company. In 1976, he and senior scientists from the University of Rochester, the Massachusetts Institute of Technology and the University of California-Berkeley became the founding members of the La Jolla Institute, a not-for-profit research and development corporation, where he remained in various positions until joining the university in 1989.

Prior to becoming a university professor, Dr. West was the director, Division of Applied Nonlinear Science, La Jolla Institute, from 1983 to 1989. During this period, he worked on the development of nonlinear dynamical models of biomedical phenomena, physical oceanography and the statistical mechanical foundations of thermodynamics. Specifically, he used renormalization group concepts to extract pattern information from time series taken from geophysical and biomedical phenomena.

Dr. West was associate director, Center for the Studies of Nonlinear Dynamics, La Jolla Institute, from 1979 to 1983. He applied some of the newly emerging concepts in nonlinear dynamics systems theory to nonlinear water wave fields and turbulence. He also examined how the branching structure of the lung and other physiological structures could be described by scaling.

Before coming to ARO, Dr. West was professor of physics, University of North Texas, 1989 to 1999; chair of the Department of Physics, 1989 to 1993; and founding director of the Center for Nonlinear Science, 1994 to 1999. During his time at the university, he did research into the quantum manifestations of chaos (energy level repulsion, ionization rate enhancement, breakdown of the Correspondence Principle); the foundations of statistical mechanics (getting random fluctuations without statistics, failure of the Green-Kubo relation, Lévy statistics); and nonlinear processing techniques applied to biomedical phenomena.

In 1992, he was elected a Fellow of the American Physical Society. In 1993, he received the Decker Scholar Award for outstanding research in complex adaptive systems from the University of North Texas and the 1994 University of North Texas' President's Award for general support of research on campus.

In 2005, he was awarded the Department of the Army's Superior Civilian Service Award for innovative research into the applications of complex adaptive systems theory to biomedical phenomena.

His biography is in *Who's Who in America* where he received the 2009 and 2011 Professional of the Year Award in Applied Physical Science and Mathematics. Dr. West also received the 2010 Department of the Army Research and Development Achievement Award for Technical Excellence, the Army Research Laboratory Publication Award and the Commander's Award for Civilian Service; in 2011 he was recognized by Cambridge Who's Who as one of the top 101 Industry Experts and received the prestigious U.S. Army Wilks Award in statistics. He is a member of the American Physical Society, American Physiological Society, American Geophysical Union, American Association for the Advancement of Science, The New York Academy of Sciences, and he is an Adjunct Professor of Physics at Duke University (2000-present).

Dr. West has produced more than 375 publications, including 13 books, and his published research has received more than 12,000 citations with an h-factor of 52.

His outside interests include art, philosophy and reading, and he is a *shodan* (black belt first degree) in Judo.

Michael Wraback

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Research Interests

Dr. Michael Wraback's research has spanned many aspects of the physics of semiconductors and semiconductor devices, with a focus on ultrafast phenomena occurring on femtosecond and picosecond time scales. He specializes in the study of nonequilibrium carrier dynamics and transport, as well as the manipulation of the polarization of electromagnetic radiation in high contrast ultrafast modulators and terahertz detectors through photoinduced optical anisotropy.

Dr. Wraback is currently the leader of the nitride semiconductor optoelectronics team within the Electro-Optics and Photonics Division of the Sensors and Electron Devices Directorate. He provides technical oversight of research in III-V nitride MBE and MOCVD growth of ultraviolet (UV), visible, and infrared (IR) optoelectronic materials and devices; processing, fabrication and testing of UV emitters and detectors; THz optoelectronics; high efficiency solar cells and visible light emitters and detectors; and theoretical and experimental studies of carrier dynamics and transport in wide bandgap semiconductors. Most recently, Dr. Wraback has been investigating the optical properties of spontaneously forming nanostructures and heterogeneous devices employing nitride semiconductors and their impact on the performance of UV, visible and THz emitters and detectors.

Biography

Dr. Michael Wraback received his Bachelor of Science in physics from Georgetown University in 1985, his B.M.E. in mechanical engineering from the Catholic University of America in 1986, and his Master of Science and Ph.D. in physics from Brown University in 1988 and 1992, respectively, under the direction of Jan Tauc. With the help of an IBM Doctoral Fellowship he performed the first direct measurements of hot carrier relaxation and photoinduced bleaching in amorphous semiconductors.

As a postdoctoral associate from 1992 to 1994, Dr. Wraback developed ARL's first femtosecond spectroscopy laboratory, and used it to probe excitonic optical nonlinearities associated with ultrafast polarization rotation in high contrast optical modulators based upon optically anisotropic semiconductor quantum wells. This work was instrumental to the 1994 Department of the Army R&D Achievement (RDA) Award and the 1994 Paul A. Siple Medal at the Army Science Conference received by Dr. Wraback's team. Dr. Wraback continued this work as a research physicist at ARL, demonstrating a THz frequency high contrast optical modulator based on virtual exciton effects, for which he received a 1997 RDA Award, and a THz radiation detector. He also extended this work to the UV spectral range by developing a high contrast UV modulator using the optical anisotropy in wurtzite ZnO grown along a nonpolar direction. He has been granted three patents for his work on modulators and THz detectors employing optical anisotropy and the creation of this anisotropy through novel materials growth and processing.

Dr. Wraback initiated a research program in wide bandgap semiconductor optoelectronics in response to a growing Army need for low cost ultraviolet sources and detectors for biodetection and sensing applications. He employed femtosecond electroabsorption measurements in GaN p-i-n diodes to perform the first direct measurements of the electron velocity-field characteristic, transient velocity overshoot and negative differential resistance in GaN. The knowledge gained from these measurements has guided the development of Gunn diode THz sources, high frequency electronics and avalanche photodiodes. Dr. Wraback received a 2002 Research and Development Achievement (RDA) Award and Best Paper Award at the 2002 Army Science Conference for his work in this area. As team leader for Nitride Semiconductor Optoelectronics, he has been instrumental to the development of the first laboratory for the study of subpicosecond ultraviolet emission from wide bandgap semiconductors in 2002, and the development of a new type of AlGaN containing nanoscale compositional inhomogeneities with enhanced ultraviolet radiative efficiency, even in the presence of large defect densities. This research resulted in a 2005 RDA Award and the 2005 ARL Honorary Award for Science, as well as two patents that have been licensed by industry. Dr. Wraback has also extended the utility of nitride semiconductors to the THz spectral range, for which he received a 2009 RDA Award for exploiting their polarization properties to develop novel high performance THz sources.

Dr. Wraback has authored more than 100 publications and presentations, including more than 50 invited presentations. His work has received more than 1,500 citations. He is also a Fellow of the American Physical Society, and a member of the Optical Society of America, Phi Beta Kappa and Sigma Xi.

Dr. Wraback is devoted to his wife and three daughters, and has been active in the coaching of youth softball and soccer. He also enjoys singing, directing and writing classical choral music, and has been involved in these capacities with several church groups over the past two decades, including the recording of two CDs. Currently he is incorporating his love of music into the teaching of sixth grade religious education (i.e., Old Testament) at his parish church.

ARL Leadership through the Years

ARL was provisionally established at Adelphi, Maryland, in July 1992, formally activated on October 2, 1992, and permanently established on November 2, 1992.

ARL is the Army's premier laboratory for basic and applied research and analysis. ARL consists of the Army Research Office (ARO) and six Directorates—Computational and Information Sciences; Human Research and Engineering; Sensors and Electron Devices; Survivability and Lethality Analysis; Vehicle Technology; and Weapons and Materials Research. The Army relies on the ARL Team for scientific discoveries, technologic advances and analyses that provide Soldiers with the capability to win on the battlefield.

The Army Research Office executes the Army extramural basic research program in scientific and engineering disciplines. The Laboratory now consists of approximately 2,000 military and civilian employees with an annual budget of more than $1 billion.

At its inception, ARL assumed operational control of Laboratory Command (LABCOM) headquarters, the seven laboratories (formerly under LABCOM direction), the LABCOM Installation Support Activity, and Special Technology Offices. Though ARL has gone through several reorganizations, it maintains management control over the former LABCOM entities.

ARL has consistently provided the enabling technologies in many of the Army's most important weapons systems. Technology and analysis products are moved into Army Research, Development and Engineering Centers (RDECs) and to other Army, Department of Defense (DoD), government and industry customers. ARL programs are focused on key science and technology underpinnings that will enable ARL to provide a full spectrum of capabilities to the Army supporting a more versatile, agile, survivable, lethal, deployable and sustainable force.

Richard Vitali

During Richard Vitali's tenure as the acting ARL Director, the ARL Fellows were established. A native of Hartford, Connecticut, and an alumnus of St. Lawrence University from where he earned a Bachelor of Science in physics, Richard Vitali began his career at the Aberdeen Proving Ground's Ballistic Research Laboratory where he was chief, Warhead Mechanics Division; chief, Terminal Ballistics division; and chief, Vulnerability Division. The results of his research can still be seen today in many areas, including M-1 tanks.

In 1985, while serving at the Army Materiel Command, he was instrumental in the formulation of ARL's predecessor LABCOM, and began planning the physical consolidation of the disparate Army laboratories under a concept recommended to the President as LAB 21, a blueprint for the Army's future. Later, as director of corporate laboratories at LABCOM, Richard Vitali oversaw the seven laboratories spanning missions from human performance to ballistics.

Under his direction, LABCOM was the most successful DoD entity in the Army's Productivity Capital Investment Program, saving some $22 million and 197 man years in 1986-98.

Richard Vitali was instrumental in the awarding of a contract to ARL's Army High Performance Computing Research Center for Army-wide research issues. He was also the chairman of a technology exchange program with France, and developed and maintained close working ties with his counterparts in NATO and non-NATO countries.

He received many awards during his career, including a Presidential Rank Award, a Presidential Citation, the Meritorious and Exceptional Civilian Service Awards, and the Research and Development Awards.

Dr. John W. Lyons

Dr. John W. Lyons, a physical chemist with degrees from Harvard College and Washington University in St. Louis, Missouri, served as the first director of ARL from 1993-1998. During this time, ARL launched its federated laboratory initiative, implemented a new personnel system, and focused on technologies to “digitize the battlefield.” ARL was recognized with 4 Hammer Awards for management innovations as part of the National Partnership for Reinventing Government.

He served in research and development positions with the Monsanto Co. from 1955 until 1973 when he joined the National Bureau of Standards (NBS) in Gaithersburg, Maryland. At NBS, he was the first director of the Center for Fire Research and in 1978, became the first director of the National Engineering Laboratory, a unit that eventually included about half of the NBS programs. In 1990, Dr. Lyons was appointed by President George Bush to be the ninth director of NBS, by that time renamed the National Institute of Standards and Technology (NIST).

He has published four books and more than 60 papers, and holds a dozen patents. He has served on many boards and commissions, most recently the National Commission on Superconductivity, the National Critical Technologies Panel and the Federal Advisory Commission on Consolidation and Conversion of Defense Research and Development Laboratories. In 1993, he chaired the Blue Ribbon Committee on Research and Public Services for the Board of Regents, University of Maryland System.

Dr. Lyons was elected to the National Academy of Engineering in 1985. He is a fellow of the American Association for the Advancement of Science and of the Washington Academy of Science, as well as member of the American Chemical Society and Sigma Xi. Dr. Lyons was elected by the ARL Fellowship as the first honorary ARL Fellow.

He is married to the former Grace Hanley. They have four children and eight grandchildren.

Dr. Robert W. Whalin

Dr. Robert Whalin, ARL's second director, came to the organization in December 1998 and retired after 36 years of service in early 2003. Prior to this appointment, he served as the first permanent civilian director of the Engineer Waterways Experiment Station in Vicksburg, Mississippi, from 1992-1998.

A native of Richmond, Kentucky, he has a bachelor's degree in physics from the University of Kentucky, a master's degree in physics from the University of Illinois and a Ph.D. in physical oceanography from Texas A&M University. He is both a registered engineer and a renowned coastal engineer. In addition, he has served as adjunct professor at Mississippi State University, Texas A&M University and the University of Mississippi.

Some of his major awards include the Presidential Rank Award of Meritorious Executive in 1987 and 2002; the Presidential Rank Award of Distinguished Executive in 1994; the Department of the Army Meritorious Civilian Service Award in 1993 and 1998; the Department of the Army Award for Outstanding Achievement in Equal Opportunity in 1985 and 1997; and the Silver Order of the deFleury Medal in 1998.

Dr. Whalin is a member of Phi Kappa Phi and Phi Eta Sigma honorary fraternities, Sigma Xi research society, American Society of Civil Engineers, American Society for Engineering Education, Army Engineer Association, Association of the United States Army and the National Defense Industrial Association. He has authored and co-authored more than 100 technical papers and reports.

He is now the associate dean for engineering and professor of engineering with the College of Science, Engineering and Technology at Jackson State University in Jackson, Mississippi.

John M. Miller

John Miller was the Director of the U.S. Army Research Laboratory from March 2003 to June 2012. Under his leadership, the laboratory received numerous awards and recognition, including two Research Laboratory of the Year Awards (2004 and 2006), and 11 Army Greatest Invention Awards (2003, 2004, 2005, 2006 and 2008). In May 2012, John Miller was inducted as an Honorary ARL Fellow.

From 1992 until his assignment as ARL Director in March 2003, he served in a number of management and leadership positions in ARL. He was the ARL Associate Director for Plans, Programs and Budget with responsibility for strategic and operational planning, revenue allocation, and program formulation and direction. John Miller held positions as Division Chief, Deputy Director and Director of the Sensors and Electron Devices Directorate where he was responsible for directing basic and applied research in sensors and signal and image processing technologies.

From 1971 through 1992, John Miller held positions as Project Engineer, Branch Chief and Deputy Laboratory Director of the U.S. Army Harry Diamond Laboratories. During this time, he was responsible for research and development in radar fuzing, telemetry, battlefield radars and automatic target recognition.

From 1969 through 1971, he was a Project Engineer at the Pratt and Whitney Aircraft Company where he was responsible for design of components for advanced turbofan engines for the F14 and F15 aircraft.

John Miller holds a bachelor's degree in aerospace engineering and a master's degree in mechanical engineering, both from the University of Maryland. He is a past recipient of the U.S. Army Research and Development Achievement Award (1980), the Army Superior Civilian Service Award (2003) and Presidential Rank Award (2007).

Dr. Allen F. Grum, P.E.

Dr. Allen F. Grum served as the Associate Director for Strategic Initiatives and as the Associate Director for Science and Technology at ARL in Adelphi from 2002 to 2005. He provided a generous amount of assistance to the Fellows during his tenure.

Dr. Grum came to ARL from Mercer University, Macon, Georgia, under provision of the Intergovernmental Personnel Act. At Mercer, Dr. Grum was a professor of industrial and systems engineering.

Dr. Grum's schooling includes a Bachelor of Science from the United States Military Academy, a Master of Science from MIT, and a Ph.D. in Engineering Economic Systems from Stanford.

Following his graduation from West Point, he served in the Corps of Engineers. His assignments included platoon leader and company commander in Korea; assistant to the Resident Engineer, Fort Campbell, Kentucky; technical operations officer, Engineer Research and Development Laboratories, Fort Belvoir, Virginia; Commander, Engineer Detachment, Bordeaux, France; Topographic Operations Officer, Engineer Intelligence Center, Schwetzigen, Germany; Commander, 589th Engineer Battalion, Vietnam; Chief, General Material Branch, Office of the Chief of Research and Development, Department of the Army; and Director, Waterways Experiment Station, Vicksburg, Mississippi.

He was an assistant professor in the Department of Military Art and Engineering at the Military Academy prior to his tour in Vietnam. Following this, he returned to West Point as associate professor of operations research and management science, and, subsequently, professor and head of the Engineering Department.

After 33 years of Army service, Dr. Grum retired as a Brigadier General and moved to Mercer University to help start a new engineering school. His academic positions at Mercer included Dean; Associate Dean for Graduate Studies; Chair, Mechanical and Industrial Engineering Department; and Director of the Program in Industrial Management. He also served as the Kaolin Chair of Engineering.

His Army awards include the Distinguished Service Medal, the Legion of Merit with Oak Leaf Cluster, the Meritorious Service Medal with Oak Leaf Cluster, the Bronze Star Medal with "V" device and Oak Leaf Cluster, and the Army Commendation Medal.

Civilian honors include induction into the Iota Chapter (Cooper Union) of Tau Beta Pi as a Distinguished Engineer, recognition as Teacher of the Year in the Mercer School of Engineering, 1996-97, and Distinguished Visiting Scholar, Department of Urban Systems Engineering, George Mason University, 1997. He is a licensed professional engineer in New York and Georgia.

He has served on the Army Science Board, participated in a Board of Army Science and Technology study and a Transportation Research Board study; and has extensive consulting experience.

Dr. Grum was selected by the ARL Fellows as an Honorary Fellow and continues his dedication to ARL by consulting with the Army Research Office and with elements of ARL at Adelphi. He is married to the former Jane Patterson of Aiken, South Carolina. They have five grown children.

Dr. Volker Weiss

Dr. Volker Weiss previously served as the Associate Director for Science and Technology at the U.S. Army Research Laboratory from March 2007 to March 2011. Dr. Weiss served at ARL as a research professor from Syracuse University, under the Intergovernmental Personnel Act (IPA). He served as the senior advisor to the ARL Director on the quality and direction of the ARL technical program in basic research, applied research and technical analysis.

As a Professor of Engineering and Physics at Syracuse University, Dr. Weiss has served on the faculty since 1957. His teaching and research contributions are in the area of mechanical behavior of materials, especially fracture mechanics, and metal physics. He has also introduced logic programming computer methods to problems in Materials Science and Engineering. His connection with U.S. Army sponsored research started in the mid 1950s when he conducted and participated in research programs with Watertown Arsenal on residual stresses, fracture, fatigue and rolling contact fatigue. After the well known Sagamore Research Conference Series was started under U.S. Army sponsorship in 1954, he served as the Syracuse project director and editor of the proceedings for almost 20 years. He has published more than 75 papers, edited 23 books, and is the co-inventor on several patents.

In the administration of Syracuse University, he served as Director of the Metallurgical Research Laboratory, as Associate Chairman for Materials Science, as Associate Dean for Research in the Engineering College, and as Vice President for Research and Dean of the Graduate School.

Dr. Weiss is a Fellow of the American Society for Metals (ASM International). He is also the recipient of a NATO Senior Scientist Fellowship (1967-1968); the NASA Minor Award (1968); the Adams Memorial Award of the American Welding Society; and a Fulbright Professorship to Austria for the fall semester in 1992. Dr. Weiss studied engineering physics in Graz and Vienna, Austria, where he received the Dipl.-Ing diploma.

Subsequently, he studied metallurgy and solid state physics at Syracuse University under a Fulbright Scholarship. After receiving a doctorate in Syracuse University's Solid State Science and Technology Program, he joined the faculty of Syracuse University in 1957.

Dr. Weiss was selected as an honorary ARL Fellow in March 2011.

Dr. Ozden Ochoa

Dr. Ozden Ochoa is a professor of mechanical engineering at Texas A&M University and is currently serving as the Associate Director for Science and Technology for the U.S. Army Research Laboratory. She is a Fellow of the American Society of Mechanical Engineers and the American Society for Composites. Dr. Ochoa served as the Director of Aerospace Sciences and Materials Directorate at U.S. Air Force Office of Scientific Research in Arlington, Virginia from 2005-2006. She actively conducted research and established focus areas in composites as the senior technologist (Composites-ST) at the Materials and Manufacturing Directorate at Wright Patterson Air Force Base in Ohio from 2003 to 2005.

From 1999 to 2005, Dr. Ochoa was an advisor to the NATO Science for Peace Project working with a team of Canadian, Russian, Belarusian and Ukrainian scientists and engineers. Additionally, from 1997 to 1999, as the program manager of at AFOSR, she developed the portfolio for Mechanics of Composites as a fundamental research area. Dr. Ochoa spent a year in 1986 at Bell Helicopter Textron to implement fracture mechanics of composites into design and development of helicopter blades. Her on-campus leadership includes service as Associate Dean of Graduate Studies and Thrust Area Lead for Composite Structure and Materials at NSF Offshore Technology Research Center.

Dr. Ochoa served as the president of the American Society for Composites from 2006 to 2007 and on the Board of Governors of the American Society of Mechanical Engineers from 2004 to 2007. At present, she is the president of the Executive Council of the International Committee for Composite Materials. Among her many honors are the 2005 American Society for Composites-Destech Award in Composites; American Society of Mechanical Engineers Dedicated Service Award; Texas A&M University International Excellence Award; and the Texas A&M University Honors Program Teacher/Scholar Award and International Excellence Award. In 1997, she was named to the Texas A&M Mechanical Engineering Academy of Distinguished Graduates. She was recognized in 2003 as a Texas A&M Dwight Look College of Engineering Fellow. Dr. Ochoa is a member of Pi Tau Sigma, Phi Kappa Phi and Sigma Xi.

Her research contributions in the past three decades in mechanics of composite materials and structures with applications in the aerospace, offshore, automotive and industries have culminated in over 200 journal and proceeding publications, technical reports and one book.

She has advised 35 master's and Ph.D. students. Her research focus is on integrating computational and experimental mechanics to address material and structural characterization of fiber-reinforced polymer and ceramic matrix composites, and multi-functional carbon foams. Her research programs are sponsored by AFOSR, NSF, NASA and numerous companies.

Dr. Ochoa holds a bachelor's degree in mechanical engineering from Bogazici University (Robert College) in Turkey, and a master's degree in nuclear engineering and a doctorate in mechanical engineering, both from Texas A&M.

Former ARL Fellows

Emeriti

Arthur Ballato
Time and Frequency, Electro- and Crystal Physics

Harold Breaux
High-Performance Computing

Carl Campagnuolo
Nonchemical Energy Conversion

Mitra Dutta
Microelectronics

Donald Eccleshall
Advanced Survivability Techniques

Henry Everitt
Condensed Matter Physics

Georges Garinther
Acoustics and Human Performance

Gary Hagnauer
Novel Polymer Materials

Russell Harmon
Geosciences

Gerald Iafrate
Physical and Engineering Sciences

Clarence Kitchens, Jr.
Fluid and Blast Dynamics

J. Terrence Klopcic
Nuclear Instrumentation and Directed Energy

Richard Leavitt
Semiconductor Quantum-Well
and Super Lattice Structures

Herbert Leupold
Magnetics

Emeriti *(continued)*

James McGarrity
Semiconductor Electronics

F. Barry McClean
Radiation Effects on Electronic Materials

Donald Messier
Structural Materials (Ceramics)

Charles Murphy
Aeronautics and Missile Dynamics

T. Kevin O'Brien
Structures and Materials

Ronald Pinnick
Computational and Information Sciences

Edward Poindexter
Materials Science

John Powell
Electromagnetic Theory

G. Richard Price
Audition

Arunachalam "Raj" Rajendran
Continuum Mechanics

Jack "John" Rowe
Solid State Physics

Edward Schmidt
Aeroballistics and Electric Armaments

Michael Stroscio
Microelectronics

Walter Sturek
High-Performance Computing for Modeling
in Computational Fluid Dynamics

Emeriti *(continued)*

Malcolm Taylor
Nonparametric Statistics and Fuzzy Sets

John Vig
Frequency Control and Timing

Mikhail Vorontsov
Adaptive Optics and Nonlinear Dynamics

Thomas Wright
Applied Mechanics and Mathematics

ARL Honorary Fellows

Al Grum

John Lyons

John Miller

Volker Weiss

Deceased

Norman Berg

Robert Fifer

Clyde Morrison

Joseph Sattler


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