

Preventing Technology Surprise: The Army's Leading Edge Research Programs and the Subject Matter Expertise that Fuels Them

Committee

Joan M. Bienvenue

Co-Chair

Dr. Joan Bienvenue is the vice chancellor for research for the University of Texas System. In this role, she serves as a strategic partner and resource to enhance, strengthen and expand the research enterprise within and across the University of Texas System, working in partnership with UT System institutions to facilitate collaboration, guide current programs and collaborations, while identifying and building new opportunities for research engagement, growth, and leadership. She was a National Institute of Justice Research Fellow while a student at UVA, where her work focused on the development of microfluidic systems. This work was summarized in over fifteen peer-reviewed papers and book chapters and presented at many conferences; she is an inventor on six U.S. patents. In addition to this academic work, she was creator and conference chair for the annual Commonwealth Conference on National Defense and Intelligence and co-creator and Inaugural Chair of the Gordon Research Conference on Forensic Analysis of Human DNA. After completion of her graduate studies, Dr. Bienvenue was an ORISE Postdoctoral Research Fellow at the FBI. Following this appointment, she joined the Armed Forces DNA Identification Laboratory (AFDIL), as the Validation and Quality Control Supervisor where she managed a team that provided quality control and oversaw the evaluation, validation, and implementation of new technology for DNA casework analysis in support of remains identification. She joined Lockheed Martin in 2008 and served as chief scientist and program manager, in support of the development of rapid microfluidic DNA analysis systems. In June of 2013, she returned to the UVA as director of the Applied Research Institute (ARI) and was promoted to senior executive director in 2017. Under her direction, ARI served the university and the defense and intelligence communities as a conduit to facilitate collaboration and innovation between the academia and government and leveraged UVA's human and capital assets to support research, education, and training, with a focus on homeland security, national intelligence, and defense missions. Prior to her arrival at the University of Texas System, she was Executive Director and Vice Provost of the University of Tennessee - Oak Ridge Innovation Institute at the University of Tennessee. As the institute's first director, Dr. Bienvenue developed strategies for establishing new interdisciplinary graduate research in emerging fields, building workforce development and educational programs using UT and ORNL's capabilities, and leading recruitment of faculty, staff, and students. Dr. Bienvenue is a fellow of the American Academy of Forensic Sciences, nominated due to her industry experience developing technologies for DNA analysis, as well as her expertise in leading the Applied Research Institute. Dr. Bienvenue received a B.S. in chemistry from Rivier University, an M.S. in forensic science at the University of New Haven, a Ph.D. in chemistry from the University of Virginia, and an M.B.A. from the University of Mary Washington.

Peter Chung

Co-Chair

Peter W. Chung is a Professor of Mechanical Engineering at the University of Maryland in College Park and the Energetics Lead in the Center for Engineering Concepts Development. Prior to joining the faculty at Maryland, Dr. Chung was a team leader in the U.S. Army Research Laboratory and is a recipient of an Army Superior Civilian Service Medal and the 2004 Army RDECOM Outstanding Young Scientist & Engineer Award. His research is in the computational sciences of interdisciplinary and multiscale problems. His current efforts are in understanding the foundations of energy transport through engineered material systems and in developing artificial intelligence/machine learning approaches to perform scientific reasoning.

Grace M. Bochenek

Member

Dr. Grace Bochenek heads the University of Central Florida's modeling and simulation research and academic programs. She joined the University in 2021 as the director of the School of Modeling, Simulation and Training, and the Institute for Simulation and Training and most recently she leads the university's efforts to expand applied research and technology development as inaugural Executive Director for the Pegasus Research Institute.

Prior to joining UCF, Dr. Bochenek held positions in both the Departments of Energy and Defense serving as a member of the federal government Senior Executive Service, with over 30 years of technical and managerial experience. She served as the Director of the National Energy Technology Laboratory, NETL, and, in the Department of Army, as the Chief Technology Officer of the U.S. Army Materiel Command and the Director of the Tank Automotive Research, Development and Engineering Center. Dr. Bochenek held a presidential appointment as the Acting Secretary of Energy. She has been recognized with numerous awards, including the Presidential Rank Award as Meritorious Executive, a Silver Medal from the National Defense Industry Association, and Decorations for Exceptional Civilian Service from both Departments of Army and Energy. Dr. Bochenek is a member of the Academy of Science Engineering and Medicine of Florida (ASEMFL) and serves on the NASEM Board on Army Research and Development and the Army Science Board.

Dr. Bochenek earned a Ph.D. in Industrial & Systems Engineering from the University Central Florida in 1998. She received a B.S. degree in Electrical Engineering from Wayne State University and M.S. degree in Industrial & Systems Engineering from the University of Michigan.

Katherine Graef

Member

COL Graef retired in March 2021 after over 30 years of service in the United States Army. She is a distinguished military graduate of the University of Texas at Austin where she earned a degree in Classical Archaeology and was commissioned in the Ordnance Corps in 1991. She also holds a Master of Science in Logistics Management from the Florida Institute of Technology, a Master of Arts in National Security and Strategic Studies from the US Naval War College, and a Master of Arts in Strategic Studies from the US Army War College. COL Graef is certified as a Demonstrated Master Logistician by the International Society of Logistics and is a member of the Ordnance Order of Samuel Sharpe. She is also an inaugural member of the Halifax International Security Forum Peace with Women fellowship.

COL Graef is a veteran of three combat deployments in the Middle East and has traveled extensively in Africa and Europe. Her final assignment before retirement was as the Logistics Director and Army Element Commander for Special Operations Command Africa, headquartered in Stuttgart, Germany. COL Graef is married to LTC (US Army, Retired) Catherine Utnik. They live on Whidbey Island, Washington with their rambunctious Rottweiler, Keya, and a German Shepard mix of questionable parentage named Cedar.

Maria-Kristina Hayden

Member

Maria-Kristina is an internationally recognized expert in cyber hygiene and resiliency. Her mission is to raise global levels of cyber-risk awareness and enable organizations (and individuals) to take control back from cybercriminals. She has delivered attack simulations and security awareness briefings to over 15,000 people worldwide and is a frequent media commentator for the likes of Bloomberg, Forbes, HuffPost, and Consumer Affairs. Maria-Kristina also educates on cyber hygiene through social media. She was the 2022 recipient of the “Security Leader of the Year” award by Women in Technology Excellence.

She is CEO & founder of OUTFOX M INC, the world’s first boutique consulting firm focused on immersive cyberattack simulations and human-cyber risk awareness.

Maria-Kristina’s experience prior to OUTFOX M spans both public and private sectors. Most recently, she spent six years at the Bank of New York Mellon, as Director and Global Head of Cyber Wargames and Awareness, and Vice President of Cyber Intelligence.

Prior to that, she served as an Intelligence Officer for the Defense Intelligence Agency (DIA) in Washington D.C., Colombia and Peru, supported the U.S. military as an Air Force civilian at the Pentagon, analyzed cyber legislation at Booz Allen Hamilton, and conducted Congressional research in the U.S. House of Representatives.

She holds an M.S. in Cyber Intelligence from the National Intelligence University and a B.S. Security Studies and Arabic language from Georgetown. She also holds the CISM certification (Certified Information Security Manager) from ISACA, the Information Systems Audit and Control Association.

Margaret E. Kosal

Member

Dr. Margaret E. Kosal is a Professor in the Sam Nunn School of International Affairs at the Georgia Institute of Technology. Her research explores the relationships among technology, strategy, and governance, focusing on the geopolitics of emerging technologies and on reducing the threat of weapons of mass destruction. Formally trained as an experimental scientist, Dr. Kosal earned a Ph.D. in chemistry from the University of Illinois at Urbana-Champaign (UIUC) working on biomimetic and nano-structured functional materials. She is also the co-founder of a sensor company, where she led research and development of medical, biological, chemical sensors and explosives detection systems. Dr. Kosal previously has served as a Senior Advisor to the Chief of Staff of the U.S. Army, as Science and Technology Advisor within the Office of the Secretary of Defense, and as an Associate to the National Intelligence Council. She is the recipient of multiple awards including the Office of the Secretary of Defense Award for Excellence. Her numerous publications include “Nanotechnology for Chemical and Biological Defense,” the first and most rigorous to consider how nanotechnology may enable or be adapted for defensive purposes, along with potential misuse and proliferation risks. She developed and tested the first analytical framework to predict the dissemination of neurotechnologies to both the commercial and military sectors. She is a highly sought-after speaker on emerging technologies and technological surprise, including most recently at the UN Institute for Disarmament Research (UNIDIR), the UK Royal society, and the Organisation for the Prohibition of Chemical Weapons (OPCW). She also holds an appointment as Senior Fellow at the Department of Energy’s Savannah River National Laboratory (SRNL).

John J. Koszewnik

Member

Mr. John Koszewnik (NAE) is presently the Vice-Chair of the NASEM Board of Army Research and Development. He retired in 2018 as Chief Technical Officer for Achates Power where his team was responsible for the design and development of advanced diesel and gasoline internal combustion engines. Among these is the Advanced Combat Engine (ACE) now being jointly developed with Cummins, providing leap-ahead capabilities for the U.S. Army Ground Combat Fleet. Prior to joining Achates Power in 2011, Koszewnik worked at Ford Motor Company as Director of North American Diesel and as Chief Engineer V-Engine Engineering responsible for forward model engineering of all Ford's gasoline V6, V8, and V10 engines. Following Ford, Koszewnik was Senior Vice President of Construction Equipment Product Development at CNH. Koszewnik earned a Bachelor of Engineering degree from Stevens Institute of Technology and a Master of Business Administration degree from Harvard Business School. He was elected as a member of the National Academy of Engineering in 2016 based on his past and present work in engine design. He served as a co-chair of the NASEM consensus study entitled “Powering the US Army of the Future” which was published in June 2021 and as chair of the NASEM “Electrification of the Army’s Light Combat Fleet” Workshop held in 2023.

Scott C. Lenaghan

Member

Scott Lenaghan has been a faculty member at the University of Tennessee since 2011, first working as a Research Assistant Professor in both the Mechanical, Aerospace, and Biomedical Engineering (MABE) Department and Center for Renewable Carbon (CRC) prior to becoming a tenured Associate Professor in the Department of Food Science in 2021. Scott's training and expertise are truly interdisciplinary, from fundamental sciences to engineering with outstanding achievements in each area. In his current position with the Department of Food Science, Scott has been extremely successful in securing extramural funding with > \$40M awarded since 2020 with topics including global food security, plant biosensors, remote detection of decomposing bodies, and even bio-functional smart materials. In 2018, Scott, along with Neal Stewart, founded the Center for Agricultural Synthetic Biology (CASB), the first of its kind center focused on synthetic biology in agriculture. CASB has become a global leader in Plant Synthetic Biology with many of its research outputs finding commercialization routes through patents and licensing options that seek to transform global agriculture. In 2023 he received the University of Tennessee AgResearch Grantsmanship Award in recognition of his outstanding funding record, and in 2024 received the AgResearch Mid-Career Award for outstanding scholarly achievements.

Vikram Mittal

Member

Dr. Vikram Mittal has served as an Associate Professor at the United States Military Academy at West Point in the Department of Systems Engineering since 2015. From 2009 to 2015, he was a senior mechanical engineer in the vehicles and robotics group at the Charles Stark Draper Laboratory. Dr. Mittal is also a major in the United States Army Reserve currently serving as a research engineer in the 75th Innovation Command. In 2011, he deployed to Afghanistan as an engineer officer for a year in support of Operation Enduring Freedom. Dr. Mittal's research expertise includes technology forecasting, model-based systems engineering, combat modeling, and vehicle powertrain design. He has published over 50 peer-reviewed journal articles and conference proceedings in these areas. Dr. Mittal is also a contributor for Forbes.com where he writes about defense and aerospace technology. He holds a PhD in Mechanical Engineering from MIT, an MS in Engineering Sciences from Oxford, and a BS in Aeronautics from Caltech.

Karen O'Brien

Member

Karen O'Brien recently retired from a 20-year career as a Dept. of the Army Civilian that started at the Army Research Laboratory as a terminal ballistics analyst and culminated as the Deputy Chief Analytics Officer and GS-15 Analytics Division Chief at Headquarters, U.S. Army Materiel Command where she provided decision-support analytics at the 4-star level. Previously she was a Chief Evaluator at the U.S. Army Test and Evaluation Command where she designed rigorous experiments to test emerging technologies and assess their operational effectiveness, suitability, and survivability.

As a Sr. Principal Data Scientist at Modern Technology Solutions, Inc, Ms. O'Brien leads the Artificial Intelligence (AI) and Machine Learning (ML) practice with a focus on Responsible AI and robust test and evaluation of AI-enabled systems. Ms. O'Brien uses her experience building analytics organizations to help Dept. of Defense agencies launch their advanced analytics and AI/ML initiatives. A member of the Institute for Operations Research and the Management Sciences (INFORMS), Ms. O'Brien is a frequent speaker at symposia and college programs. She also volunteers as the co-lead of the Huntsville, AL chapter of Women in Data. Ms. O'Brien holds an MS in Predictive Analytics from Northwestern University.

Gregory J. Quarles

Member

Greg is the CEO and President of Applied Energetics, Inc, a public company in Tucson, AZ, focused on developing and demonstrating compact, ultra-short pulsed laser technology for directed energy and advanced manufacturing sectors. Prior to joining AE, Greg was the Chief Scientific Officer for Optica (formerly the Optical Society), has been a founding executive in two start-ups and was previously the CEO of B.E.Meyers, a family-owned technology company manufacturing opto-electronic and related products used in national security and law enforcement applications. Dr. Quarles' professional expertise includes R&D and S&T development in the commercial and defense sectors across the technology areas of lasers, optical and energetic materials, nanomaterials, directed energy, C4ISR and counter-EO, C-ISR and C-UAS for over 30 years. This expertise began at the Naval Research Laboratory following his PhD and continues in the industrial sector, providing a strong understanding of the DOD S&T enterprise and the strengths and weaknesses of adversary and ally capabilities and emerging global threats. Dr. Quarles is a Fellow of Optica and SPIE, and a Senior member of IEEE. His education includes BS dual majors in Physics and Mathematics, and MS and a PhD in Physics, all from Oklahoma State University.

Alexander H. Slocum, Sr.

Member

Alexander Slocum is the Walter M. May and A. Hazel May Professor of Mechanical Engineering at MIT, a MacVicar Faculty Teaching Fellow, a Fellow of the ASME, and a member of the National Academy of Engineering. He has 180+ patents and has helped develop 11 products that have received R&D 100 awards for “one of the one hundred best new technical products of the year”. He pioneered the deterministic design of kinematic couplings (www.kinematiccouplings.org) including the standard for all semiconductor wafer transport carriers (SEMI E57-1296). He has helped start several successful precision manufacturing equipment companies and has a passion for working with industry to solve real problems and identify fundamental research topics.

Alex is passionate about teaching and mentoring and received the 1999 Martin Luther King Jr. Leadership Award and was the Massachusetts Professor of the Year in 2000. In 2018 he was awarded the ASME Ruth and Joel Spira Outstanding Design Educator Award. At MIT in addition to being a he has been awarded the 2010 Arthur Smith Faculty Achievement Award and the 2017 Capers and Marion MacDonald Award for Excellence in Mentoring and Advising.

Teaching goes hand in hand with research, and Alex was the recipient of the Society of Manufacturing Engineer’s Frederick W. Taylor Research Medal, and the ASME Leonardo daVinci, Machine Design, Thar Energy Design, and Spira Teaching Awards. His current interests focus on the development of precision machines from medical devices and instruments to energy harvesting and storage machines. In 2010 he served on Energy Secretary Chu’s special DoE Science Team working on the Gulf Oil Spill, and in 2013 he served in the Office of Science and Technology Policy in the Executive Office of the President as the Assistant Director for Advanced Manufacturing. Since high school days, Alex has a passion for woodworking and being outdoors. Alex also loves sports from SCUBA to snowboarding to marathons and iron-distance triathlons (22 started and finished). He is intense as life is short and to be lived to the fullest with honor, passion, and completeness!

William Millonig

Staff Officer