Laboratory Assessments Board
Army Research Laboratory Technical Assessment Board
Panel on Review of Extramural Basic Research at the Army Research Laboratory

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Chair

FREDERICK R. CHANG (NAE) is the executive director of the Darwin Deason Institute for Cyber Security, the Bobby B. Lyle Centennial Distinguished Chair in Cyber Security, and Professor in the Department of Computer Science and Engineering in the Lyle School of Engineering at Southern Methodist University (SMU). He is also a senior fellow in the John Goodwin Tower Center for Political Studies in SMU's Dedman College. Additionally, Dr. Chang's career spans service in the private sector and in government including as the former director of research at the National Security Agency (NSA). He is currently the Co-Chair of the Intelligence Community Studies Board of the National Academies. He has also served as a member of the Commission on Cybersecurity for the 44th Presidency, and as a member of the Computer Science and Telecommunications Board of the National Academies. Dr. Chang is a member of the National Academy of Engineering (2016) and he has been awarded the NSA Director's Distinguished Service Medal. Dr. Chang received his B.A. from the University of California, San Diego and his M.A. and Ph.D. from the University of Oregon. He has also completed the senior executive program at the Sloan School of Management at the Massachusetts Institute of Technology.

Members

PETER A. BELING is professor and chair of systems and information engineering at the University of Virginia (UVa). Dr. Beling's research interests are in the area of decision-making in complex systems, with emphasis on adaptive decision support systems and on model-based approaches to system-of-systems design and assessment. His research has found application in a variety of domains, including mission-focused cybersecurity, reconnaissance and surveillance, prognostic and diagnostic systems, and financial decision making. He directs the UVa site of the Center for Visual and Decision Informatics, a National Science Foundation Industry/University Cooperative Research Center, and the Adaptive Decision Systems Laboratory, which focuses on data analytics and decision support in cyber-physical systems. Dr. Beling is the co-founder of the Financial Decision Engineering research group at UVa, which is a focal point for research on the mathematical modeling and risk management aspects of consumer and retail credit. Dr. Beling has served as editor and reviewer for many academic journals. He was a member of the Committee on Improving the Decision Making Abilities of Small Unit Leaders (Naval Studies Board), which authored the National Research Council Report Improving Making Abilities of Small Unit Leaders (2012). Dr. Beling received his Ph.D.in operations research from the University of California at Berkeley.

JAMES O. BERGER (NAS) is Arts and Sciences Professor of Statistics at Duke University. He was a faculty member in the Department of Statistics at Purdue University

until 1997, at which time he moved to the Institute of Statistics and Decision Sciences (now the Department of Statistical Science) at Duke University. He was the director of the National Statistical and Applied Mathematical Sciences Institute from 2002-2010. He was president of the Institute of Mathematical Statistics from 1995-1996, chair of the Section on Bayesian Statistical Science of the American Statistical Association in 1995, and president of the International Society for Bayesian Analysis during 2004. He has been involved with numerous editorial activities, including co-editorship of the *Annals of Statistics* during the period 1998-2000, and has organized or participated in the organization of over 35 conferences. Among the awards and honors Dr. Berger has received are Guggenheim and Sloan Fellowships, the COPSS President's Award in 1985, the Sigma Xi Research Award at Purdue University for contribution of the year to science in 1993, the Fisher Lectureship in 2001, election as foreign member of the Spanish Real Academia de Ciencias in 2002, election to the National Academy of Sciences in 2003, award of an honorary doctor of science degree from Purdue University in 2004, and the Wald Lectureship in 2007. Dr. Berger's research has primarily been in Bayesian statistics, foundations of statistics, statistical decision theory, simulation, model selection, and various interdisciplinary areas of science and industry, especially astronomy and the interface between computer modeling and statistics. Dr. Berger received his Ph.D, M.A., and A.B. degrees in mathematics, all from Cornell University.

JONATHAN N. BLAKELY is a research physicist. In 2003, he was awarded a National Research Council Research Associateship at the U.S. Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC). Since 2005, he has been a research physicist at AMRDEC. Additionally, from 2011 to 2017 he served as an adjunct assistant professor of physics at the University of Alabama in Huntsville. Dr. Blakely currently conducts a program of basic research in the missile research and innovation function of the Weapons Development and Integration Directorate (WDI). His research interests include nonlinear dynamics of electronic and electromagnetic systems with applications to radar, communications, networks, and cyber security. Dr. Blakely has authored more than sixty peer-reviewed papers, as well as six book chapters. He has received an Army Research and Development Achievement (RDA) Award and two Army Science Conference Best Paper Awards. Dr. Blakely received his B.S. degree in physics from the University of North Carolina and his M.A. and Ph. D. in physics from Duke University.

RANDAL E. BRYANT (NAE) is a university professor in the Computer Science Department at Carnegie Mellon University. His major research focus has been on the development of techniques to formally verify the correct behavior of both hardware and software systems. An outgrowth of the work on formal verification has been the development of efficient data structures to represent and manipulate Boolean functions symbolically. This Binary Decision Diagram (BDD) representation is widely used in a variety of tasks in computer science and computer engineering. His major educational focus is on introductory, college-level courses on computer systems, including aspects of the hardware, compiler, operating system, and networking environment of modern computers. This material provides an important foundation for both computer scientists and computer engineers. Dr. Bryant received his Ph.D. and S.M. in electrical engineering from the Massachusetts Institute of Technology and his B.S. in applied mathematics from the University of Michigan.

ALICIA L. CARRIQUIRY (NAM) is distinguished professor of liberal arts and sciences and professor of statistics at Iowa State University. She also holds the President's Chair in Statistics and is director of the Center for Statistics and Applications in Forensic

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BHARAT DOSHI is the Senior Research Scientist for Cyber Security in the US Army Communications-Electronics Research, Development, and Engineering Center (CERDEC). In this role, he develops strategies and techniques for securing current and new generation networks and information systems against all forms of attacks in the cyber domain. He also develops the strategy for the convergence of cyber security, cyber operations, and intelligence. He also leads a Department of Defense (DoD)-wide cyber community of interest, developing priorities and roadmaps for the cyber science and technology across all services and agencies in the DoD. Prior to joining the U.S. Army, Dr. Doshi worked at Johns Hopkins University Applied Physics Laboratory (JHU/APL) for 10 years, Bell Labs for 24 years, and academia for six years. He managed research organizations of up to 200. His personal research and R&D management span the whole gamut of commercial communications and networking technologies as well as major communications, networking, and cyber security programs in the DoD and the Department of Homeland Security. He is a fellow of Bell Labs and a fellow of IEEE. He held an endowed chair professorship at Univesity of Massachusetts, Amherst and a research professorship at Johns Hopkins University. He has published over 140 papers and holds 46 US patents. Dr. Doshi received his Ph.D. in operations research from Cornell University.

VIRGIL GLIGOR is a professor of electrical and computer engineering at Carnegie Mellon University. His research interests in security have ranged from access control mechanisms, penetration analysis, and denial-of-service protection to cryptographic protocols and applied cryptography. Gligor was an editorial board member of several IEEE and ACM journals, and the editor-in-chief of the IEEE *Transactions on Dependable and Secure Computing*. He was a member of several U.S. Government INFOSEC Study Groups that set research agendas in information security, and served on a National Research Council panel on information security. He received the 2006 National Information Systems Security Award jointly given by NIST and NSA in the U.S., and the 2011 Outstanding Innovation Award given by the ACM SIGSAC, and the 2013 IEEE Computer Society Technical Achievement Award. Dr. Gligor received his B.Sc., M.Sc., and Ph.D. degrees in computer science from the University of California at Berkeley.

GERALD F. GOODWIN is chief of basic research at the U.S. Army Research Institute for the Behavioral and Social Sciences. He is responsible for overseeing and directing the execution of the U.S. Army Research Institute's basic research program as well as

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WILLIAM D. GROPP (NAE) holds the Thomas M. Siebel chair in computer science at the University of Illinois at Urbana-Champaign, is the Director and Chief Scientist of the National Center for Supercomputer Applications, and was the founding director of the Parallel Computing Institute. Prior to joining Illinois in 2007, he held positions at Argonne National Laboratory, including Associate Director for the Mathematics and Computer Science Division and Senior Computer Scientist. He is known for his work on scalable numerical algorithms and software (sharing an R&D100 award and the SIAM/ACM Prize in Computational Science and Engineering for PETSc software) and for the Message Passing Interface (sharing an R&D100 award for MPICH, the dominant high-end implementation, as well as co-authoring the leading books on MPI). For his accomplishments in parallel algorithms and programming, he received the IEEE Computer Society's Sidney Fernbach award in 2008, the SIAM-SC Career Award in 2014, and the ACM/IEEE-CS Ken Kennedy Award in 2016. He is a fellow of ACM, IEEE, and SIAM. Dr. Gropp received his Ph.D in computer science from Stanford University, his M.S. in Physics from the University of Washington, and his B.S. in Mathematics from Case Western Reserve University.

BRUCE HAJEK (NAE) is professor of electrical and computer engineering in the Coordinated Science Laboratory at the University of Illinois. Communication networks and related mathematical systems theory are his main areas of interest. The communication networks include both high-speed large-scale networks and wireless networks, such as commercial cellular networks or local area wireless networks. Important issues are congestion control, routing, scheduling, pricing, adaptation to time-varying fading channels, and the convergence of different types of networks. The related mathematical systems theory includes information theory, stochastic analysis, and combinatorial optimization. Dr. Hajek received his Ph.D. in electrical engineering from the University of California, Berkeley; his M.S. in electrical engineering from the University of Illinois at Urbana-Champaign; and his B.S. in mathematics from the University of Illinois at Urbana-Champaign.

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PETER M. KOGGE is the Ted H. McCourtney Professor in the Department of Computer Science and Engineering at the University of Notre Dame. He is a concurrent professor in the Department of Electrical Engineering, and a professor in the College of Engineering. Prior to his joining Notre Dame in 1994, he was with IBM Federal Systems Division. He was appointed an IEEE Fellow in 1990 and an IBM Fellow in 1993. In 1977, he was a visiting professor in the ECE Department at the University of Massachusetts, Amherst. From 1977 through 1994, he was also an adjunct professor in the Computer Science Department of the State University of New York at Binghamton. Since 1997, he has been a distinguished visiting scientist at the Center for Integrated Space Microsystems at JPL. He is also the Research Thrust Leader for Architecture in Notre Dame's Center for Nano Science and Technology. For the 2000-2001 academic year, he was the Interim Schubmehl-Prein Chairman of the CSE Department at Notre Dame. Since 2003, he has been a concurrent professor of electrical engineering. His research interests are in advanced computer architectures using unconventional technologies such as Processing-In-Memory and nano technologies such as Quantum dot Cellular Automata (QCA). Dr. Kogge received his Ph.D. in electrical engineering from Stanford University; M.S. in systems and engineering sciences from Syracuse University, and B.S. in electrical engineering from the University of Notre Dame.

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PATRICK MCDANIEL is the William L. Weiss Professor of Information and Communications Technology in the School of Electrical Engineering and Computer Science at Pennsylvania State University and a fellow of both IEEE and ACM. He is also the director of the Institute for Networking and Security Research (INSR), a research institute focused on the study of networking and security in diverse computing environments. In addition, he is the program manager (PM) and lead scientist for the Cyber Security (CS) Collaborative Research Alliance (CRA). The CRA is led by Penn State University and includes faculty and researchers at the Army Research Laboratory, Carnegie Mellon University, Indiana University, the University of California-Davis, and the University of California-Riverside and Vencore Labs. His professional life is devoted to the pursuit of novel research in a broad array of areas of computer science. As part of that pursuit, he advises a number of graduate students and post-doctoral researchers and participates in many rewarding professional service activities. Dr. McDaniel's research focuses on a wide range of topics in computer and network security and technical public policy, with particular interests in mobile device security, adversarial machine learning, systems security, program analysis, and the integrity and security of election systems. Dr. McDaniel received his Ph.D. in electrical engineering and computer science from the University of Michigan.

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RADIA PERLMAN (NAE) is a fellow at Dell EMC Corporation. She has made many contributions to the fields of network routing and security protocols including robust and scalable network routing, spanning tree bridging, storage systems with assured delete, and distributed computation resilient to malicious participants. She wrote the textbook *Interconnections* and cowrote the textbook *Network Security*. She holds over 100 issued patents. She has received numerous awards including induction into the Inventor Hall of Fame, induction into the Internet Hall of Fame, lifetime achievement awards from ACM's SIGCOMM and Usenix, election to National Academy of Engineering, election into the Washington State Academy of Science, and an honorary doctorate from KTH. She received her P.hD. in electrical engineerinhg and computer science from the Massachusetts Institute of Technology and her S.M. and S.B. in mathematics, both from the Massachusetts Institute of Technology.

STEPHEN M. ROBINSON (NAE) is professor emeritus in the Department of Industrial and Systems Engineering at the University of Wisconsin-Madison. Dr. Robinson was elected as a member of National Academy of Engineering in its Industrial, Manufacturing, and Operational Systems Engineering Section. His research is in the development of quantitative methods for making the best use of scarce resources, which is part of the broad category of operations research methods. He works particularly on nonlinear and stochastic optimization methods for both optimization and equilibrium problems, trying both to develop the underlying theory and to find better numerical methods for solving applied problems. His recent work has focused especially on the mathematical properties of solutions of variational condition, considered as functions of the data appearing in those conditions. He has published 98 articles and in 2014 finished a term as president of INFORMS. Dr. Robinson received his Ph.D. in computer science from the University of Wisconsin-Madison.

JONATHAN M. SMITH is the Olga and Alberico Pompa Professor of Engineering and Applied Science at the University of Pennsylvania. He is also a program manager in the Information Innovation Office at the Defense Advanced Research Projects Agency (DARPA). At DARPA, he develops and executes programs in cybersecurity, networking, and distributed computing. He was elected IEEE Fellow in the class of 2001 for contributions to the technology of high-speed networking. He was previously at Bell Telephone Laboratories and Bellcore, which he joined at the AT&T divestiture. His current research interests range from programmable network infrastructures and cognitive radios to architectures for computer augmented immune response. Dr. Smith has served on the President’s Council of Advisors on Science and Technology Network and Information Technology Technical Advisory Group. He was a member of the National Research Council’s (NRC) Committee on Sensing and Communications Capabilities for Special Operations Forces and was a member of the NRC Board on Army Science and Technology. Dr. Smith received his Ph.D. in computer science from Columbia University, his M.S. in computer science from Columbia University, and his A.B. in mathematics from Boston College.

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ARLTAB Chair

JENNIE S. HWANG (NAE) is CEO of H-Technologies Group, and board trustee and distinguished adj. professor at Case Western Reserve University. Her career encompasses corporate and entrepreneurial businesses, international collaboration, research management, technology transfer and global leadership positions, as well as corporate and university governance. Among her many honors and awards are U.S. Congressional Certificates of Recognition; induction into International Hall of Fame – Women in Technology and Ohio Women Hall of Fame; named the R&D-Stars-to-Watch; Distinguished Alumni Awards; Honorary Doctoral degree; and YWCA Achievement Award. She was the CEO of International Electronic Materials Corp. and has held senior executive positions with Lockheed Martin Corp., Hanson, PLC and Sherwin-Williams Co. and co-founded entrepreneurial businesses. She is internationally recognized as a pioneer and long-standing leader in the infrastructure development of electronics miniaturization and green manufacturing. She has served as Global President of the Surface Mount Technology Association and in other global leadership positions. An international speaker and author of 475+ publications including several internationally-used books, she has lectured to tens of thousands of managers, engineers and researchers on professional development courses. Her speeches range from university commencement addresses to keynote at DoD Federal Women's Program to tutorials at the U.S. Patent and Trademark Office. She is also a prolific author and speaker on education, workforce, and social and business issues. Additionally, Dr. Hwang has served as a board director for Fortune 500 NYSE-traded and private companies and various university and civic boards, and on the International Advisory Board of the Singapore Advanced Technology and Manufacturing Institute and a number of international industry boards. On serving the National Academies, she chairs the Technical Assessment Board of Army Research Laboratory, and has served as NAE Membership Search Executive (Materials Section), National Materials and Manufacturing Board, DoD R&D Globalization Board, Committee on Forecasting Future Disruptive Technologies and NAE Award Committee, among others. She also has served as a reviewer for National Academies Reports and other national/international publications. Her formal education include Harvard University Executive Program, Columbia University Business School Governance Program, and four academic degrees (Ph.D., M.A., M.S., B.S.) in Materials Science and Metallurgical Engineering, Chemistry, and Liquid Crystal Science. The Dr. Jennie S. Hwang Award for Faculty Excellence was established at her Alma Maters. The Dr. Jennie S. Hwang YWCA Award is established in her honor, now for 17 years running, to encourage and recognize outstanding women students in STEM, Further info: www.JennieHwang.com.