The National Academies of
SCIENCES • ENGINEERING • MEDICINE

Division on Engineering and Physical Sciences
Committee on NIST Technical Programs

Panel on Review of Four Divisions of the Physical Measurement Laboratory at the National Institute of Standards and Technology (NIST)

Biographical Sketches

Chair

ELSA M. GARMIRE, NAE, is the Sydney E. Junkins Professor and Dean Emerita of the Thayer School of Engineering at Dartmouth College. Her research interests include lasers and optics. Her research has had three main themes: nonlinear optics, integrated optics, and advanced semiconductor lasers. She has contributed to three key concepts in nonlinear optics: laser-stimulation of molecular vibrations (Stimulated Raman Scattering), sound waves (Stimulated Brillouin Scattering), and self-focusing of light beams (Spatial Solitons). Recently, she has investigated nonlinear optical devices in semiconductors, including optical bistability, optical computing and photorefractivity. Her most recent emphasis is on understanding picosecond nonlinearities in semiconductor multiple quantum wells. Her second continuing interest has been integrated optics—with contributions to design, fabrication, analysis and testing in semiconductor, lithium niobate and glass devices, as well as infrared waveguides. Her third interest is in improved lasers, particularly semiconductor lasers. She has investigated the mode-locking and mode-control of lasers, semiconductor laser arrays, ultra-short pulse generation and propagation, and new geometries for semiconductor lasers. Dr. Garmine earned her A.B. in physics from Harvard University and her Ph.D. in physics from Massachusetts Institute of Technology.

Members

ROBERT H. AUSTIN, NAS, is professor of physics in the Department of Physics at Princeton University. His research spans three areas: protein dynamics and conformational statistics; DNA dynamics and base pair sequence elastic variability; and applications of micro/nanofabrication technology to cellular and molecular biology. He is a master at combining physical tools and theories with biochemical techniques to attack fundamental problems in protein and nucleic acid dynamics and function. His observations of single DNA molecules using microlithography led to an understanding of their physical properties, which are important in biology and biotechnology. He is a fellow of the American Physical Society and the American Association for the Advancement of Science. He received his B.A. in physics from Hope College, and his M.S. and Ph.D. in physics from the University of Illinois, Urbana-Champaign.

JESSE “JACK” L. BEAUCHAMP, NAS, is Mary and Charles Ferkel Professor of Chemistry at the California Institute of Technology. Beginning with the first development of ion cyclotron resonance spectroscopy, Dr. Beauchamp has been involved with the development and application of mass spectrometry along with other spectroscopic methods to a wide range of scientific investigations over the past 46 years. Major scientific contributions have involved the development of new instruments and techniques for studies of the structures, reaction dynamics, and properties of organic, inorganic biological molecules and ions in the gas phase. Current research efforts include: development of novel reagents and methods for proteomics (e.g. cross linking reagents and stable isotope labels), studies of the detailed mechanism of electron capture and electron transfer dissociation, investigations of reaction dynamics at gas-liquid interfaces, studies of the structure and reaction dynamics of small molecular clusters, development of instrumentation for in situ elemental and chemical analysis on Mars, and an examination of the chemistry of Titan’s atmosphere and surface. Dr. Beauchamp received a B.S. from the California Institute of Technology and a Ph.D. from Harvard University.

LOUIS E. BRUS, NAS, is a professor of chemistry at Columbia University. His research is in the physical chemistry of materials—interfaces, nanocrystals, and nanotubes, especially in relation to optical and electronic properties. In each situation he tries to figure out what the electrons are doing. This work can include theoretical modeling, numerical density functional theory (DFT) calculations, experimental chemical physics, and synthetic chemistry. He tries to understand the size evolution of solid state properties from molecular properties. He also seeks to create new materials with nanoscale structures by both kinetic and thermodynamic self-assembly methods. He specializes in electric force microscopy and confocal laser optical microscopy for observation of single nano-objects. In the last several years, he has worked on carbon nanotubes, transition metal oxide nanocrystals, silicon nanocrystals, and Ag nanocrystals acting as microscopic antennas for local electromagnetic field enhancement. He received a B.S. in chemical physics from Rice University and a Ph.D. in chemical physics from Columbia University.

THOMAS BUDINGER, NAE/NAM, is professor of bioengineering at the University of California, Berkeley, and affiliate senior scientist at Lawrence Berkeley National Laboratory. He has also been professor of bioinstrumentation, electrical engineering, and computer science. In 2004, he completed a six-year appointment as founding chair of the Department of Bioengineering at Berkeley. He is also professor emeritus at the University of California, San Francisco Medical Center where he served as director of the Magnetic Resonance Science Center. His research interests include: imaging instrumentation and analysis including design and fabrication of medical imaging systems and related three dimensional reconstruction algorithms. Applications of imaging methods have included detection and tracking of icebergs, topographic mapping of ocean bottoms, electron microscopy study of biological objects, and more recently, construction of high resolution positron emission tomography and high field magnetic resonance human imaging systems. The medical science applications include studies of anatomy and development of methods for imaging heart muscle flow, development of probes for non-invasive detection of cancer and anatomical and metabolic studies of the human brain, particularly in relationship to aging and human behavior. His work in safety and human health aspects of ionizing radiation and non-ionizing electromagnetic fields have included long term effects of galactic cosmic particles in space travel and safe thresholds for human exposures to oscillating and static magnetic fields. Dr. Budinger is a member of the Institute of Electrical and Electronics Engineers (IEEE) and the American Institute for Medical and Biological Engineering, and past president of the International Society for Magnetic Resonance in Medicine and of the World Society for Molecular Imaging. He has a B.S. in chemistry (magna cum laude) from Regis College; an M.S. in physical oceanography from the University of Washington, Seattle; an M.D. from the University of Colorado; and a Ph.D. in medical physics from the University of California, Berkeley.

ANDREW N. CLELAND is the John A. MacLean Senior Professor for Quantum Engineering Innovation, and is a member of the Institute for Molecular Engineering at the University of Chicago. He is the director of the Pritzker Nanofabrication Facility and a senior scientist at Argonne National Laboratory. His research focuses on developing superconducting quantum circuits and nanoscale optical and mechanical devices. His accomplishments include the first demonstration of a mechanical system cooled to its quantum ground state; the demonstration of a high fidelity, scalable superconducting quantum bit operating at the threshold for quantum error-correction; and the development of an piezooptomechanical system transducing between the microwave and optical frequency domains. Dr. Cleland is the author of over 120 peer-reviewed publications. His work was recognized as the Science “Breakthrough of the Year” for 2010, and selected as one of the “Top Ten Discoveries in Physics” by the Institute of Physics (United Kingdom) in both 2010 and 2011. He is a fellow of the American Association for the Advancement of Science and the American Physical Society. He earned a Ph.D. in physics from the University of California, Berkeley.

JAMES J. COLEMAN, NAE is Erik Jonsson School of Engineering and Computer Science Distinguished Chair and Professor at the University of Texas at Dallas. Photonic devices, such as diode lasers, LEDs, and integrated photonic circuits, are at the heart of fiber optic telecommunications systems which comprise modern cellular wireless and internet data networks. The materials growth, structural design, fabrication and integration of photonic devices and especially diode lasers are the main themes his work. Modern semiconductor materials, include a wide variety of compounds utilizing a large fraction of the

periodic chart. His work on these materials makes use of lattice-matched thin layer crystals as well as strained layers in which the strain is accommodated elastically. Emerging diode laser applications require a greater variety of materials, a wider range of emission wavelengths, higher output power, and narrower spectral linewidth. The quest for smaller and more efficient photonic devices has led him to work on semiconductor nanotechnology including ultrathin layer quantum wells and 3D quantum dots. He was professor of electrical and computer engineering at the University of Illinois, Urbana, for 31 years and held the Intel Alumni Endowed Chair. He has 10 U.S. patents and has given more than 100 invited presentations. He is a fellow of the IEEE, OSA, SPIE, the American Physical Society, the American Association for the Advancement of Science, and the National Academy of Inventors. He received the B.S., M.S., and Ph.D. degrees in electrical engineering from the University of Illinois, Urbana.

GRAHAM R. FLEMING, NAS, is distinguished professor of chemistry at the University of California, Berkeley. His research focuses on developing an understanding of condensed phase dynamics with applications to chemistry, biophysics, and condensed matter physics. To this end, his laboratory combines ultrafast spectroscopy, analytical theory, and simulation. The primary steps of photosynthesis—light harvesting and electron transfer—are topics of particular interest. He has discovered many of the design principles used to optimize and regulate photosynthetic light harvesting, including most recently the role of quantum coherence in enhancing efficiency. He has also characterized the timescales and molecular mechanism by which water and other highly polar liquids accommodate to changes in electronic structure of solute, and he demonstrated that chemically reactive motion in solution is often free, ballistic motion (rather than diffusive) over chemically significant length scales and for chemically significant timescales. His work often depends on the development of new non-linear optical techniques and examples include fluorescence interferometry, new classes of photon echo spectroscopy and two-dimensional electronic and Raman spectroscopy. He earned a B.Sc. in chemistry from the University of Bristol and a Ph.D. in physical chemistry from the University of London.

DEREK F. JACKSON KIMBALL is a professor in the Department of Physics at the California State University – East Bay. His research uses techniques of experimental atomic physics and nonlinear optics for precision tests of the fundamental laws of physics. In particular, his research focuses on searches for exotic spin-dependent interactions that may have a connection to dark matter or dark energy. Dr. Jackson Kimball was awarded his Ph.D. in 2005 from the University of California at Berkeley under the mentorship of Prof. Dmitry Budker. Afterwards, he joined the faculty of California State University – East Bay where he has mentored over 50 undergraduate students in his research laboratory.

AHARON KAPITULNIK, NAS, is professor of applied physics and physics in the Departments of Applied Physics and Physics at the Geballe Laboratory for Advanced Materials at Stanford University. Dr. Kapitulnik's research activities focus on studies of the quantum-mechanical dominated properties of materials, which exhibit unexpected “emergent” phenomena because of their unique electronic structure that is dominated by strong correlations and topology. Of particular interest to his group are phenomena related to the occurrence of novel forms of superconductivity and magnetism, and the interplay between them resulting in quantum critical phenomena. For example, the study of the paradigmatic quantum phase transition between a two-dimensional superconductor and insulator, with possible intervening unconventional metallic states. Following the discovery of high-Tc superconductivity in the cuprates, Dr. Kapitulnik's group engaged in a number of key experiments to better understand the nature of the electronic properties of these materials, with key contributions to the understanding of their vortex state and the nature of the electronic state just above where superconductivity sets in. Dr. Kapitulnik's group also specializes in the development of precision detection instrumentation. In particular they developed the Sagnac Interferometer for ultra-sensitive measurements of time-reversal symmetry breaking effects in solids, particularly unconventional superconductors. Using their technical expertise, they also developed novel, cantilever-based, instrumentation for testing the inverse-square-law of gravity at sub-mm distances. Dr. Kapitulnik earned a B.Sc. and Ph.D. in physics from Tel Aviv University.

DANIEL KLEPPNER, NAS, is Lester Wolfe Professor of Physics, Emeritus, and a principal investigator in the Research Laboratory of Electronics (RLE) at the Massachusetts Institute of Technology (MIT). He has made fundamental contributions to atomic physics and quantum optics, mainly using hydrogen and

hydrogen-like atoms. He built new devices, performed spectroscopic tests of extreme precision and investigated novel quantum phenomena. Previously, he was associate and interim director of RLE. Along with Norman Ramsey, he developed the Hydrogen Maser, later used as an atomic clock of unprecedented stability. Applications of this early work range from coordination of radiosignals in long base-line radio astronomy, to satellite-based global positioning systems. Dr. Kleppner was also a pioneer in the physics of Rydberg atoms. These very excited atoms have a wide range of remarkable properties. His proposal and demonstration of the inhibition of spontaneous emission from Rydberg atoms was an early step in Cavity Quantum Electrodynamics, concerned with the radiative properties of atoms in confined spaces. Dr. Kleppner's investigations of Rydberg atom spectra in high electric and magnetic fields provided deep physical insight into the implications of classical chaos for quantum systems. Dr. Kleppner and RLE colleague Dr. Thomas Greytak were among the first to look for quantum degeneracy effects in ultra-cold gases. After a 20-year long quest, in 1998, they achieved Bose-Einstein condensation (BEC) in hydrogen. In the meanwhile, they developed tools instrumental to the 1995 discovery, by RLE alumni Eric Cornell and Carl Weiman, and RLE's Wolfgang Ketterle, of BEC in alkali atoms. These include the technique of evaporative cooling, demonstrated in collaboration with Harald Hess. Bose-Einstein condensates and fermionic degenerate samples of cold atoms, currently created under various forms in many laboratories around the world, represent a new form of matter at the lowest temperatures ever achieved. Dr. Kleppner has also served on numerous national committees charged with investigating key scientific or social issues. Dr. Kleppner has a B.A. from the University of Cambridge, a B.S. from Williams College and a Ph.D. from Harvard University.

MICHAEL J. MANFRA is the Bill and Dee O'Brien Chair Professor of Physics and Astronomy, professor of electrical and computer engineering, and professor of materials engineering at Purdue University. His current research interests include: molecular beam epitaxy of ultra-high purity semiconductors, topological phases of matter, electronic transport at low temperatures and high magnetic fields in mesoscopic structures, and quantum computing. Dr. Manfra joined the faculty of Purdue in 2009 after working for 10 years in the Semiconductor Physics Department of Bell Laboratories. He holds an A.B. in physics from Harvard University and a Ph.D. in physics from Boston University.

PIERRE MEYSTRE is Regents Professor Emeritus of Optical Sciences and Physics and holds the Chair of Quantum Optics at the University of Arizona. Dr. Meystre's research interests include theoretical quantum optics, nonlinear optics, cavity quantum electrodynamics, ultracold atoms and molecules, and atom optics. Prior to coming to Arizona, Dr. Meystre was a staff scientist at the Max-Planck-Institute for Quantum Optics. He is a fellow of the American Physical Society, the Optical Society of America, and the American Association for the Advancement of Science. Dr. Meystre obtained his physics diploma and Ph.D. from the Swiss Federal Institute of Technology in Lausanne, respectively, and the Habilitation in Theoretical Physics from the University of Munich.

CLARK TU-CUONG NGUYEN is a professor in the Electrical Engineering and Computer Sciences Department at the University of California at Berkeley, where his main research thrust focuses on micromechanical signal processing. Dr. Nguyen’s research explores the art of micromechanical circuit design using microelectromechanical systems (MEMS) technology while realizing high-Q, low-noise oscillators, medium-scale integrated (MSI) mechanical filtering circuits, and mechanical radios capable of listening with no need for battery power. He is the founder of Discera, the first company to commercialize MEMS-based timing oscillators, where today, the highest volume oscillator product on the market is a MEMS-based oscillator. Dr. Nguyen also previously served as a program manager in the Microsystems Technology Office of the Defense Advanced Research Projects Agency (DARPA), where he created and managed ten different MEMS-centric programs amounting to more than $356 million spent over eight years. He has chaired three major Institute of Electrical and Electronics Engineers (IEEE) conferences that include the 2010 and 2011 IEEE Frequency Control Symposia, and the 2017 IEEE MEMS Conference. Dr. Nguyen is an IEEE Fellow, and recently finished a term as president of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society (UFFC-S). He earned a Ph.D. in electrical engineering and computer sciences from the University of California at Berkeley.

M. ALLEN NORTHRUP, NAE, has over 30 years of diagnostics instrumentation development as a chief executive officer, chief technology officer, inventor and entrepreneur. He was a co-founder, chief technology officer and vice president of Research of Cepheid, co-founder of Microfluidic Systems which was sold to PositiveID Corporation, and is currently co-founder and chief executive officer of MIODx. MIODx is commercializing polymerase chain reaction (PRC) based cancer assays developed at the San Francisco Veterans Hospital, as well as, immuno-sequencing based diagnostics for cancer and infectious diseases from University of California, San Francisco. After several years working in the analytical instrument business, (Finnigan MAT), he spent eight years as a researcher at the Lawrence Livermore National Laboratory and at the University of California at Berkeley where he was the first to demonstrate the PCR process in a micro-machined silicon chip. He also co-developed micro-actuators and micro-actuator materials. Dr. Northrup has 54 issued U.S. and foreign patents, over 40 peer-reviewed publications, and several engineering and entrepreneurial business awards, including an INC. Magazine award as one the fastest growing small U.S. companies in 2010-2011, and R&D Magazine 100 Award for Cepheid Technology. Dr. Northrup is on the Science Advisory Board of Fluigent (Paris) and Pharmafluidics (Gent, Belgium), a fellow and a chairman of the American Institute of Medical and Biological Engineers and a fellow of the Royal Society of Chemistry. Dr. Northrup has a Ph.D. in biomedical engineering from the University of California, Davis.

JOHN D. PRESTAGE is a physicist at the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) and an elected fellow of the American Physical Society. His research interests include: developing ultra-stable space-based atomic ion clocks to advance spacecraft navigation and planetary radio science; developing miniature ion trap based clocks; developing fundamental physics tests through atomic clock comparisons; and ion mass spectrometer instruments based on linear ion traps. His professional experience includes serving as science and technology lead for the NASA/JPL Deep Space Atomic Clock (DSAC) mission where a small ion-atomic clock is being adapted for long-term deep space and Earth orbit operation. This technology is the prototype for the next generation Global Positioning System (GPS) III space atomic clock. Prior to DSAC, he led the Space Communications and Navigation (SCaN) Space Ion Clock Technology Development Team. He invented and developed the first linear rf ion trap, the first multi-pole linear ion trap together with ion transfer methodology to enable the ultra-stable atomic ion clock. These ion-clocks were first to exceed stability of H-maser clocks. Linear ion traps are now used world-wide for ion clocks, quantum computing, and quadrupole mass analyzers. He also designed and delivered a 10 cm3 ion trap physics package to the ongoing Defense Advanced Research Projects Agency (DARPA) IMPACT small clock competition. He has developed and carried out new tests of Local Lorentz Invariance and Local Position Invariance – both cornerstones of Einstein's General Relativity. Two NASA mission proposals (SMEX and MIDEX mission Space-Time) were based on this work. This work started the modern day clock comparison searches for time variation of the fundamental constants. He is an active Institute of Electrical and Electronics Engineers (IEEE) member in the International Frequency Control Symposium. He is a member of the American Physical Society (APS), Topical Groups on Gravitation, Institute of Materials Science (IMS), Division of Atomic, Molecular and Optical Physics (DAMOP), and the Forum on Industrial and Applied Physics (FIAP). He has a B.S. in mathematics, and an M.S. degree in physics from the University of Alabama. He also has a Ph.D. in atomic physics from Yale University.

DANIEL PROBER is a professor if applied physics and director of undergraduate studies at Yale University. His research interests include: experimental solid state physics and superconductivity; coherent quantum transport and noise studies; superconducting quantum detectors: microwave UV and x-ray detectors; and nanostructure fabrication techniques. His laboratory is developing. His laboratory is developing superconducting thin-film devices as sensitive photon detectors for frequencies from the visible to the far-infrared. Dr. Prober earned a Ph.D. from Harvard University in experimental condensed matter physics.

CHARLES TAHAN is a senior physicist and the technical director of the Laboratory for Physical Sciences (LPS) located at the University of Maryland-College Park. His research interests lie at the intersection of condensed matter systems and quantum information science, where new opportunities for physics and technology emerge, such as quantum computers. As a principle investigator he has made important

contributions to silicon-based quantum computing, strongly correlated photonics ("solid-light"), quantum phonodynamics, spin-photon/phonon coupling, and new superconducting-semiconductor devices. As a technical lead/program manager he has driven technical progress and started new programs in spin-based and superconducting-based quantum computing, in quantum characterization, verification, and validation (QCVV), and in new and emerging qubit science and technology (NEQST). He joined LPS in September 2009 as a principle investigator and program manager in the quantum computing group, becoming a supervisor in 2013. In 2007, he joined Booz Allen Hamilton as a technical consultant for quantum information science and technology programs at DARPA's Microsystems Technology Office (MTO), helping to create the Quantum Entanglement Science and Technology (QuEST) program among others. From 2005-2007, he was a National Science Foundation Distinguished International Postdoctoral Research Fellow at the Cavendish Laboratory of the University of Cambridge, UK, with visiting research positions at the University of Melbourne, Australia, and the University of Tokyo, Japan. He earned a Ph.D. in physics at the University of Wisconsin-Madison in 2005 and a B.Sci. in physics and computer science from the College of William and Mary in 2000. He received the Presidential Early Career Award for Scientists and Engineers (PECASE) and the NSA Researcher of the Year Award in 2012, was elected a fellow of the American Physical Society in 2015, was elevated to Defense Intelligence Senior Leader (Senior Executive Service) in 2016, and was named a Director of National Intelligence Science and Technology Fellow in 2017.

DAVID A. THOMPSON, NAE, is an IBM Fellow Emeritus and was formerly the director of the Advanced Magnetic Recording Laboratory at IBM Alamaden Research Center. Dr. Thompson's research interests include data storage, magnetic recording, hard disk drive, magnetism, magnetic films, sensors, recording heads, magnetic media, perpendicular recording, memory and storage, optical storage, alternative methods of storage, electronics engineering, and education. His primary specialty has been research and development for hard disk drive recording, especially the magnetic recording process. This includes thin film recording heads, thin film disks, and the associated fields of tribology and data coding. Before coming to IBM he was an assistant professor of electrical engineering at Carnegie Institute of Technology, now Carnegie-Mellon University. He is a life fellow of the Institute of Electrical and Electronics Engineers (IEEE). He is also a member of Sigma Xi, Tau Beta Pi, Eta Kappa Nu, and the IEEE Magnetics Society. He has served terms as president, vice president, and secretary-treasurer of the IEEE Magnetics Society. He was conference chairman of the first Magnetic Recording Conference. Dr. Thompson was also a founding member of the Technical Advisory Board of the Magnetics Technology Centre at the National University of Singapore. He is an IBM Master Inventor, with 33 U.S. patents and was inducted into the Silicon Valley Engineering Hall of Fame and the National Inventors Hall of Fame. He received B.S., M.S., and Ph.D. degrees in electrical engineering from Carnegie Institute of Technology.

ADAM P. WAX is the Theodore Kennedy Professor in the Department of Biomedical Engineering at Duke University. At Duke University he is the leader of an independent research program in biophotonics. The primary research application of this program is the early detection of cancer using light scattering and interferometry. Additional research areas include development of optical tools for cell biology applications and novel microscopy techniques. He also founded two companies, Lumedica and Oncoscope, Incorporated, to commercialize low cost imaging technology developed at Duke University. He is a fellow of OSA, SPIE and AIMBE, and has 19 issued U.S. patents. He has a B.S. in physics (cum laude) from the State University of New York at Albany and a B.S. in electrical engineering (cum laude) from Rensselaer Polytechnic Institute. He also has an M.A. and Ph.D. in physics from Duke University.

ANDREW M. WEINER, NAE, is the Scifres Family Distinguished Professor of Electrical and Computer Engineering in the School of Electrical and Computer Engineering at Purdue University. Dr. Weiner's research focuses on ultrafast optics, with an emphasis on the processing of extremely high speed lightwave signals and ultrabroadband radio-frequency signals. He is especially well-known for his pioneering work on programmable generation of arbitrary ultrashort pulse waveforms, which has found application both in fiber optic networks and in ultrafast optical science laboratories around the world. He was previously a Department of Defense National Security Science and Engineering Faculty Fellow. He serves as editor-in-chief of Optics Express and is the inventor of 16 U.S. patents. Dr. Weiner earned his S.M., S.B., and Sc.D. in electrical engineering from the Massachusetts Institute of Technology.

ALAN ELI WILLNER, NAE, is the Steven and Kathryn Sample Chaired Professor in Engineering in the Ming Hsieh Department of Electrical Engineering of the Viterbi School of Engineering at the University of Southern California. His research expertise includes: optical communication systems, photonics technologies, optical signal processing, optical fiber and free-space systems, and optical networking. He received the Ph.D. (1988) in Electrical Engineering from Columbia University, as well as a B.A. (1982) in Physics and an Honorary Doctorate (Honoris Causa, 2012) from Yeshiva University. Prof. Willner worked at AT&T Bell Laboratories and Bellcore, is a Member of the US Army Science Board, and was Founder and CTO of Phaethon Communications. Prof. Willner has received the following honors: Int'l Fellow of the UK Royal Academy of Engineering; Presidential Faculty Fellows Award from White House; IEEE Eric Sumner Award; Fulbright, Guggenheim, and Packard Foundation Fellowships; US DoD Vannevar Bush Faculty Fellowship; Fellow of National Academy of Inventors; Institution of Engineering & Technology (IET) J.J. Thomson Medal; Egleston Medal for Distinguished Engineering Achievement; Optical Society (OSA) Forman Engineering Excellence Award; IEEE Photonics Society Engineering Achievement Award; Honorary Professor of Huazhong Univ.; SPIE President's Award; OSA Hopkins Leadership Award; 2001 Eddy Paper Award from Pennwell Publications for Best Contributed Technical Article; and IEEE Globecom Best Paper Award. He is a Fellow of AAAS, IEEE, IET, OSA and SPIE. Prof. Willner's activities include: Co-Chair of US National Academies' Study on Optics & Photonics; President of OSA; President of IEEE Photonics Society; General Co-Chair of CLEO; Chair of Unclassified Technical Program for IEEE MILCOM; and Editor-in-Chief of OSA Optics Letters, IEEE/OSA Journal of Lightwave Technology, and IEEE Journal of Selected Topics in Quantum Electronics.