2018 IEEE AWARDS

IEEE
Advancing Technology for Humanity

Dear IEEE Members, Honorees, Colleagues, and Friends:

Welcome to the 2018 IEEE VIC Summit and Honors Ceremony!

Across the spectrum of technology and around the globe, there are amazing innovations and cutting-edge research and development happening. These technologies—and more—will be discussed at this second IEEE Vision, Innovation, and Challenges (VIC) Summit. The IEEE VIC Summit presents a unique opportunity to connect with and learn from some of the technology "Giants" in the world, including top innovators, disruptors, and entrepreneurs in an intimate setting, as well as take advantage of networking opportunities with peers to exchange experiences and build partnerships. We hope that everyone who attends will be empowered and revive your passion in your field of interest, or learn from a synergistic field.

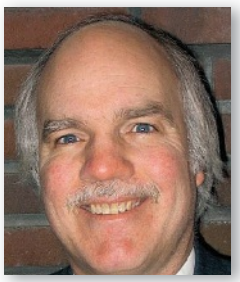
Much of this work being done today was made possible by the pioneering achievements of those we are recognizing at the IEEE Honors Ceremony. Tonight's award ceremony is a celebration of the contributions of some of the greatest minds of our time who have made a lasting impact on society.

It is important that we take opportunities like the Honors Ceremony to come together and recognize the accomplishments and contributions of our honorees. Not only to thank those who are receiving these awards and recognize their successes, but also to inspire the rest of us when we hear of their visionary efforts to triumph over challenges.

The best technologists working today are those who believe that learning is a journey that they will always be on. No matter how much they learn, no matter what advancements they make, they always try to strive for more, to envision that next advance that will be even more beneficial to the world.

On behalf of IEEE's Board of Directors, we would like to extend our sincere gratitude to our generous awards sponsors and to all of the nominators, endorsers, volunteers, and professional staff for their dedication to making our Awards Program such a success. We would like to acknowledge all of this year's well-qualified nominees, the diverse array of educators, engineers, scientists, innovators, visionaries, leaders, and practitioners who exemplify the mission of the IEEE of advancing technology for the benefit of humanity.

Jim Jefferies,
IEEE President and CEO



Mark J. Karol,
IEEE Awards Board Chair

AGENDA FOR IEEE VISION, INNOVATION, AND CHALLENGES SUMMIT

9:30 AM **Welcome Remarks** *(Gold Ballroom)*
Welcome from James A. Jefferies, IEEE President
Introductions by "Master of Ceremonies"
Brent Lunceford, President of Memstronics

9:45 AM **Keynote: New Immersive Mediums—the Search for Egg Yolk:** Todd Richmond, Director, Mixed Reality Lab/Studio, USC

10:30 AM *Break*

10:45 AM **Geometry Processing and Animated Film:**
Mark Meyer, Senior Scientist,
Pixar Research Group

11:20 AM **The New Gene Therapy: CRISPR-Cas9 and the Future of Medicine:**
Moderated by Glenn Zorpette,
Executive Editor, *IEEE Spectrum,* with John Tisdale, NIH, and Bruce Conklin, UCSF

12:00 PM **Luncheon & Networking Mixer** *(Ralston Room)*

1:30 PM **Robots on the Rise: The Future of Robotics and AI:** Moderated by Oussama Khatib, Professor, Stanford University, with
Cynthia Breazeal, Associate Prof. at MIT & Founder and Chief Scientist of Jibo, Inc.;
Grant Imahara, Consulting Mechanical Designer, Disney Research, and Host, Discovery Channel's *MythBusters*; Eric Krotkov, COO at Toyota Research Institute; and Marc Raibert, Founder and CEO of Boston Dynamics

3:30 PM *Break*

4:00 PM **Social Impact, and the Role of Engineers in Today's Society:**
Moderated by Matthew Fiedler, Cofounder and CTO, re:3D, with Ryan Cousins, CEO, krtkl, inc.; Kevin Noetker, Cofounder and CEO, Ampaire; and Veronica Osinski, Founder and Managing Partner, Trifecta Capital

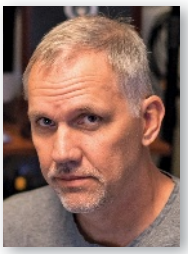
4:30 PM Closing Remarks by Brent Lunceford

5:00 PM **Networking & Red-Carpet Reception** *(Regency Foyer)*

6:00 PM **Honors Ceremony Gala and Dinner** *(Grand Ballroom)*

SPEAKERS

Brent Lunceford is a serial innovator who for two decades has driven product innovation and new market entry at both Fortune 500 companies and high-growth ventures. He is President of Memstronics specializing in distributed intelligence systems, data analytics, and artificial intelligence. Brent led product and business development at 3M's Global Innovation Center, and he formed and led engineering and production teams at Silicon Light Machines, acquired by Cypress Semiconductor. In his early career, he invented new technologies, raised funding and managed innovation programs at the Microelectronic Computer Technology Corporation (MCC) resulting in the development and commercialization of multiple disruptive technologies including the first commercialized metal MEMS, laser-based manufacturing systems, and new electronic and optical materials. He is an Entrepreneurial Advisor for the University of Texas-Cockrell School of Engineering Innovation Center. Brent lives in Austin, Texas where he is an outdoor enthusiast, youth mentor, and sports coach.



Todd Richmond currently heads the University of Southern California's Mixed Reality Lab as its director. He works in a variety of areas related to emerging disruptive technologies tied to augmented reality, virtual reality, mixed reality, and artificial intelligence and their implications/applications for training, learning, and operations. Future environments for communication and collaboration, immersive technologies, interactive education, and visualization and analytics are some of the areas in which he and his team focus. He is also a member of the research faculty at USC's School of Cinematic Arts, working to better understand virtual, augmented, and mixed reality (VAMR). He earned a B.A. in chemistry from the University of San Diego and a Ph.D. in chemistry from the California University of Technology, followed by a postdoctoral fellowship in protein engineering at the University of California, San Francisco.

Mark Meyer is a senior scientist and lead of the research group at Pixar Animation Studios. He received his B.S. in computer science and computer engineering from Northwestern University and his Ph.D. from the California Institute of Technology (Caltech). Before joining Pixar in 2003, he worked on virtual reality and simulation at Argonne National Laboratory and instructed computer graphics courses in the Computer Science Department at Caltech. He is currently working in Pixar's Research Group on projects including character articulation, rendering acceleration, physical simulation, and machine learning.

Glenn Zorpette is executive editor of *IEEE Spectrum* magazine. His interests include chipmaking, vehicles, nuclear and national-security technologies, audio electronics, DIY, war-zone reconstruction, technology applications in the developing world, and digital imaging. His reporting for *IEEE Spectrum* has taken him to Iraq, Afghanistan, Kuwait, the South Pole, Kwajalein Atoll, South Africa, and an underwater habitat in the Caribbean. He has won a National Magazine Award for reporting, has been a finalist in the same category, and has won a Grand Neal Award, among other honors. An IEEE Fellow, he holds a B.S. in electrical engineering from Brown University.

John Tisdale joined the Molecular and Clinical Hematology Branch of the National Heart, Lung and Blood Institute (NHLBI) in 1998 and is now chief of the Cellular and Molecular Therapeutics Section. His group focuses on developing curative strategies for sickle cell disease through transplantation of allogeneic or genetically modified autologous bone marrow stem cells. He graduated from the College of Charleston in South Carolina with a B.A. in chemistry in 1986. He then earned his M.D. from the Medical University of South Carolina in 1990. He completed an internal medicine and chief residency at Vanderbilt University Medical Center in Nashville and then trained in hematology in the Hematology Branch of the NHLBI, where he served as a postdoctoral fellow.

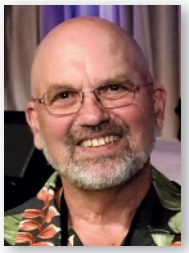
Cynthia Breazeal is an associate professor of media arts and sciences at the Massachusetts Institute of Technology, where she founded and directs the Personal Robots Group at the Media Lab. She is also founder and chief scientist of Jibo, Inc. She is an award-winning innovator, designer, and entrepreneur. Her research focuses on developing principles, techniques, and technologies for personal robots that are socially intelligent, can interact and communicate with people in human-centric terms, and can work with humans as peers. She has developed some of the world's most famous robot creatures ranging from small hexapod robots, to embedding robotic technologies into familiar everyday artifacts, to creating highly expressive humanoid robots and robot characters. She has recently been working on investigating the impact of social robots on helping people of all ages to achieve personal goals that contribute to quality of life in domains such as education, health, wellbeing, and emotive connection and engagement despite distance.

Bruce R. Conklin is an investigator at the Gladstone Institutes and a professor of medicine, ophthalmology, and pharmacology at the University of California, San Francisco. He is also the deputy director of the Innovative Genomics Institute, focusing on biomedical applications of clustered regularly interspaced short palindromic repeats (CRISPR) technology. His research focuses on using genome engineering to identify therapeutic approaches to human disease. Using CRISPR gene editing, his lab is perfecting allele-specific editing of dominant negative genes causing incurable disease of the retina, motor neurons, and the heart. He is the founder of several public stem cell and genomics projects and the Gladstone Stem Cell Core and the Gladstone Genomics Core laboratories. He pioneered the field of using designer G protein coupled receptors (RASSLs) for tissue engineering. He is a member of the American Society for Clinical Investigation and is a Fellow of the California Academy of Sciences.

Oussama Khatib is a professor with the Department of Computer Science at Stanford University. His seminal work on robot planning and control has radically changed the basis of manipulation, interaction, locomotion, and other aspects of system design critical to the development of human-friendly robots. He developed the artificial potential field concept for reactive control of robots, which became a fundamental framework for real-time obstacle avoidance. His pioneering contribution of control in operational space rather than joint space has been integral to advances in whole-body motion and force control, and in humanoid robotics. His recent work on a robotics-based approach to human motor control and human motion understanding is providing substantial benefits to restoring movement and improving human performance. His work on learning human skills and mapping to robot-compliant strategies is becoming fundamental to increasing the autonomous capabilities of robots in performing complex tasks and cooperating with people.

Grant Imahara is recognized as the electronics and robots expert from Discovery Channel's *Mythbusters.* Using a blend of science and fun, he and his colleagues put urban legends to the test, sometimes with explosive results. He brings his unique skills to the *White Rabbit Project* on Netflix. He has hosted *Punkin Chunkin* and *Killer Robots* for Science Channel, and he has appeared on *Junkyard Wars* and Comedy Central's *BattleBots*. Before his career in front of the camera, Grant spent nine years working behind the scenes in special effects as an animatronics engineer and modelmaker for George Lucas' Industrial Light and Magic, working on numerous blockbusters. An IEEE Senior Member, he has a B.S. in electrical engineering from the University of Southern California. He has numerous official commendations from various organizations, including the City of Los Angeles, the City of San Francisco, and the White House. Currently he consults for Walt Disney Imagineering on next-generation robots for Disney's theme parks.

Eric Krotkov serves as the chief operating officer at Toyota Research Institute, where he directs R&D and manages operations for the company. Before joining Toyota, he founded Griffin Technologies, a consulting and software firm specializing in robotics and machine perception. Griffin consulted on robotics for the U.S. Defense Advanced Research Projects Agency (DARPA) and other government agencies. From 1997 to 1999, he served as a program manager at DARPA, where he created the Tactical Mobile Robotics (TMR) program, which developed man-packable robots used for defusing roadside bombs in areas of armed conflict including Iraq and Afghanistan. He also led programs developing automation systems for surface ships and navigation systems for submarines. From 1988 to 1997, at Carnegie Mellon University he taught and researched computer vision, machine perception, and mobile robotics, with a focus on planetary rovers. He earned his Ph.D. in computer and information science from the University of Pennsylvania and his B.A. from Haverford College.

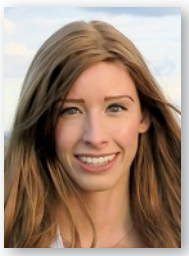


Marc Raibert is founder and chief executive officer of Boston Dynamics, a company that creates some of the world's most advanced dynamic robots, such as BigDog, Atlas, Spot, and Handle. These robots are inspired by the remarkable ability of animals to move with agility, dexterity, perception, and intelligence. A key ingredient of these robots is their dynamic behavior, which contributes to their life-like qualities and their effectiveness in the real-world. Before starting Boston Dynamics, he was professor of electrical engineering and computer science at the Massachusetts Institute of Technology (MIT) from 1986 to 1995. Prior to that he was associate professor of computer science and robotics at Carnegie Mellon University (CMU) from 1980 to 1986. While at CMU and MIT, he founded the Leg Laboratory, a lab that helped establish the scientific basis for highly dynamic robots. He is a Fellow of the Association for the Advancement of Artificial Intelligence and member of the U.S. National Academy of Engineering.

Matthew Fiedler is the Co-founder and CTO of re:3D® Inc., a Texas- and Puerto Rico-based, full-service company committed to affordable, large-scale industrial 3D printing providing custom hardware, engineering, and printing services. With 400+ customers in 50+ countries, re:3D manufactures Gigabot—the world's largest industrial 3D printer under $9K. Gigabot rivals the printing quality of other industrial printers at 1/10th the cost and boasts a build volume starting at 30X larger than desktop models. re:3D's customers represent domain experts in aerospace, defense, and academia, including: US Army Aviation & Missile Research, Development and Engineering; Naval Air Weapons Center; US Air Force; Air National Guard; NASA Langley; NASA Johnson Space Center; Wyle Integrated Science & Engineering; Rolls-Royce Singapore; Autodesk; Honda Performance; the US Department of State; Harvard; and MIT. It also maintains multiple partnerships with 3D printing materials science experts, including an active collaboration with the University of Texas-Austin.

Ryan Cousins is cofounder and chief executive officer of krtkl inc. Based in Silicon Valley, krtkl ("critical") makes life easier for companies developing heavily connected and automated products. Through prebuilt hardware modules, hardware accelerators, "soft" intellectual property, and engineering services, krtkl serves industries from robotics and unmanned aircraft to video processing and networking. The company is known for producing highly reliable systems and for squeezing every drop of performance out of the most compact, power-efficient, and affordable designs possible. His primary expertise is in program management, product development, supply chain/logistics, intellectual property, strategic partnerships, and revenue. He serves as a volunteer board member for Boost! West Oakland—a no-cost tutoring and mentoring program for K-5 students—and is a young entrepreneur mentor with Operation HOPE. Ryan earned a B.S. in mechanical engineering, with an emphasis in thermodynamics and fluid mechanics, from the University of California, Los Angeles.

Kevin Noertker, cofounder and chief executive officer of Ampaire, spent seven years in aerospace research and development and program management at Northrop Grumman, running multimillion dollar programs and developing and fielding advanced aircraft and satellite technologies. He has a proven track record for initiating and delivering innovative technical solutions, building and motivating teams, and optimizing systems. He now runs Ampaire, an aerospace startup based in Los Angeles that's developing electric airplanes. Ampaire is nearly two years old and enables Kevin to combine his technical and management skills with his entrepreneurial vision, love for the outdoors, and passion for things that fly. He graduated with honors from the California Institute of Technology in 2009 with a B.S. in engineering.



Veronica Osinski is founding managing partner at Trifecta Capital. She previously apprenticed in venture capital at S-Cubed Capital under Mark Stevens, former managing partner at Sequoia Capital. While at S-Cubed, she sourced deals in Secret, Second Spectrum, and Embark. She attended board meetings for Elemental Technologies, Zapproved, Deal Décor, and Second Spectrum. Previous to venture capital, she launched a dairy farm while living in rural South Africa. She graduated *summa cum laude* with a degree in finance from the University of Southern California at the age of 20. While in college, she conducted research on the financial crash, executive compensation, and conflict of interest, and published her honors thesis on the impact of microfinance on inequality. During college she started businesses including a second-hand marketplace for women's clothing and a photo editing/filtering business.

Friday, 11 May 2018
The Palace Hotel
San Francisco, California, USA

OPENING REMARKS—IEEE President and CEO, James A. Jefferies & IEEE President-Elect, José M.F. Moura

IEEE Spectrum Technology in the Service of Society Award	Project Loon
IEEE Spectrum Emerging Technology Award	ASML Holding N.V.
IEEE Corporate Innovation Award	Pixar Animation Studios
IEEE Richard M. Emberson Award	Donald N. Heirman
IEEE Haraden Pratt Award	Loretta Arellano
IEEE Honorary Membership	Anton Zeilinger
IEEE Honorary Membership	Mike Lazaridis
IEEE Robert N. Noyce Medal	Tsugio Makimoto
IEEE Edison Medal	Eli Yablonovitch
IEEE Alexander Graham Bell Medal	Nambi Seshadri
IEEE Founders Medal	Narayana Murthy
IEEE Richard W. Hamming Medal	Erdal Arikan
IEEE Medal for Environmental and Safety Technologies	Jerome Faist and Frank K. Tittel
IEEE Jack S. Kilby Signal Processing Medal	Bede Liu
IEEE Medal for Innovations in Healthcare Technology	Thomas F. Budinger
IEEE/RSE James Clerk Maxwell Medal	Thomas Haug and Philippe Dupuis
IEEE Jun-ichi Nishizawa Medal	Joe C. Campbell
IEEE James H. Mulligan, Jr. Education Medal	Delores M. Etter
IEEE Dennis J. Picard Medal for Radar Technologies and Applications	Mark E. Davis
IEEE Medal in Power Engineering	Hirofumi Akagi
IEEE Simon Ramo Medal	Heinz Stoewer
IEEE John von Neumann Medal	Patrick Cousot
IEEE Medal of Honor	Bradford W. Parkinson

IEEE MEDALS, AWARDS, AND RECOGNITIONS

The following awards are presented at the annual IEEE Honors Ceremony Gala

Also Featured in the Booklet

2018 MEDALS AND RECOGNITION SPONSORS

The awards presented by the 2018 IEEE Honors Ceremony Gala are supported by the generosity of the following organizations and societies

IEEE Spectrum Technology in the Service of Society Award

Sponsored by IEEE Spectrum

Project Loon, X, the moonshot factory

Imagine wireless base stations floating in the stratosphere, providing broadband-speed Internet connections to the people below, no matter how remote their location. That's the idea behind Project Loon, a venture at X, a sibling company of Google. Project Loon uses high-altitude balloons and solar power to quickly establish wireless networks with data rates as great as those of 4G LTE.

From a trial involving 30 balloons over the south island of New Zealand in 2013, the project has gone on to successful trials in Peru, Brazil, and most recently, Puerto Rico, where Loon balloons provided wireless service in the aftermath of Hurricane Maria to 200,000 residents of the island. In order to provide wireless service to a specific region, Project Loon engineers had to solve immense challenges, including inventing techniques to keep a cluster of stratospheric balloons over an area and for an extended period. They developed extremely sophisticated machine-learning algorithms that enable the balloons to navigate to an area and then maintain position and altitude in the powerful wind currents in the stratosphere. The system accomplishes this in part by relying on dynamic maps of the stratospheric winds that are updated constantly. Other software manages the unique challenges of maintaining connectivity in a cellular wireless network in which not only the customers are moving around, but also the base stations.

X is now negotiating partnerships with local communications providers to use Loon to establish Internet service to some of the world's most underserved regions. They're also looking forward to working closely with industry and governments to help them better prepare for disasters.

IEEE Spectrum Emerging Technology Award

Sponsored by IEEE Spectrum

ASML Holding N.V.

Gordon Moore, who won the IEEE Medal of Honor in 2008, famously declared in 1965 that the number of transistors on an integrated circuit was doubling at regular intervals, and that it would continue to do so for the foreseeable future. The prophecy has held up beyond anyone's expectations (including Moore's). So now, 53 years later, the "Law," as it is known, still defines the pace of progress in the $409-billion-a-year semiconductor industry. But to keep the pace, remarkable breakthroughs must be achieved regularly. Some of the greatest of these occur in the area of photolithography, in which radiation is used to project patterns onto photosensitive materials in successive steps to create the transistors of an integrated circuit (IC). Starting out with visible light in the 1960s, lithographers had to invent new processes based on shorter and shorter wavelengths to produce smaller and smaller features. To continue the relentless pace, they had no choice but to move into the realm of X-rays, or Extreme Ultra Violet (EUV).

The challenges were great. There was no powerful and reliable source of the EUV radiation. The exposure process would have to be carried out in a total vacuum, because air absorbs EUV radiation. Also, lenses are useless at these wavelengths, so researchers had to build special multilayer mirrors. Over a period of decades, ASML managed to solve these and countless other challenges and develop a complete, working EUV lithography system. This pioneering system is set to begin producing commercial ICs later this year at several of the world's most advanced chip-fab facilities.

IEEE Corporate Innovation Award

Sponsored by IEEE

Pixar Animation Studios

PIXAR
ANIMATION STUDIOS

For a long history of pioneering innovations in computer animation and computer graphics

An Academy Award®-winning film studio with world-renowned technical, creative, and production capabilities in the art of computer animation, Pixar Animation Studios has produced deep and lasting innovations in virtually every aspect of computer graphics. Starting in the early 1970s, Pixar technologists led by Edwin Catmull have been at the forefront of the field. Pixar has created some of the most successful and beloved animated films of all time, and their techniques have been responsible for the adoption of computer graphics in an extraordinary number of industries beyond entertainment. Pixar began as the Graphics Group, which was part of the Computer Division of Lucasfilm. At Lucasfilm, the team achieved key computer-generated imagery milestones. In 1986 Pixar was acquired by Apple cofounder Steve Jobs, and the studio's short film, *Luxo Jr.*, was a milestone in the use of 3D computer animation to tell a story. In 1995, Pixar forever impacted the future of filmmaking and animation with the release of its first feature film, *Toy Story*. *Toy Story* completely upended how animated films were produced, moving from 2D cell animation to full 3D computer animation. Among their many innovations, Pixar invented digital image compositing, including the now-standard Porter-Duff compositing algebra. Pixar's depth buffer algorithm for hidden surface removal, texture mapping, programmable shading, and stochastic sampling became the basis of all modern renderers. Their RenderMan renderer has been used in hundreds of motion pictures. Pixar's introduction of volume rendering became an indispensable tool not only in filmmaking but also in scientific visualization and medical imaging. Pixar also pioneered particle systems for creating a wide variety of physical phenomena. Marionette was Pixar's first proprietary 3D animation program, enabling the creation of *Toy Story* and used for animated films through 2011. In 2012, Pixar launched the Presto animation system with a powerful layering and referencing model to allow large teams of artists to work collaboratively on extremely rich and complicated imagery and motion.

Located in Emeryville, CA, USA, Pixar is currently under the direction of Edwin Catmull, cofounder of Pixar Animation Studios and president of Pixar and Walt Disney Animation Studios.

Scope: For an outstanding innovation by an organization in an IEEE field of interest.

IEEE Richard M. Emberson Award

Sponsored by the IEEE Technical Activities Board

Donald Heirman

For leadership and service to industry and IEEE, and for the development of global consensus and education in IEEE technical fields and standards

A recognized expert in electromagnetic compatibility standardization, Donald Heirman has dedicated his career to the development of standards and education in the field and extending technology to address business, consumer, and social needs. EMC is the ability of electronic devices to operate near each other without experiencing the effects of electromagnetic interference, and Heirman's in-depth understanding of EMC coupled with his dedication to progressing the field of EMC product compliance measurements has resulted in many invaluable contributions. He spent over 30 years with Bell Laboratories, where he focused on reducing low-frequency and radio-frequency noise in telephone circuits, providing regulatory compliance testing strategies and designing, building, and operating compliance test facilities. There he founded the Global Product Compliance Laboratory and was responsible for the company's major EMC and associated regulatory activities. He was instrumental in Bell's participation in the IEEE EMC Society, ANSI Accredited Standard Committee C63 (EMC), and international EMC standardization committees. He has chaired or been a principal technical contributor to U.S. and international EMC standards organizations including ANSI ASC C63 and the International Electrotechnical Commission's (IEC) International Special Committee on Radio Interference (CISPR). He presently chairs the IEC's Advisory Committee on EMC (ACEC) and is a life member of the U.S. National Committee of the IEC's Technical Management Committee. Heirman's outstanding service to the IEEE, particularly to the IEEE EMC Society and to the IEEE Standards Association, includes serving on the IEEE Board of Directors, president of the IEEE EMC Society and IEEE Standards Association, multiple terms as vice president of the IEEE EMC Society, and as chair of multiple technical committees in the society. Heirman is also a voting member of the Smart Electric Power Alliance (SEPA) Testing and Certification Committee and chairman of its Electromagnetic Interoperability Issues Working Group, which provides EMC recommendations for smart grid equipment and systems.

An IEEE Life Fellow and recipient of the 2008 IEC Lord Kelvin Award, Heirman is president of Don HEIRMAN Consultants, Lincroft, NJ, USA, which he founded in 1997.

Scope: For distinguished service advancing the technical objectives of the IEEE.

IEEE Haraden Pratt Award

Sponsored by the IEEE Foundation

Loretta Arellano

For furthering IEEE's objectives, promoting cooperation among IEEE organizational units, and exemplary innovation in developing IEEE volunteer leaders

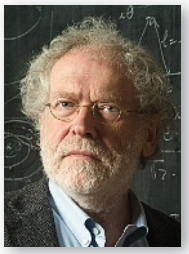
A dedicated leader whose volunteer efforts have spanned many IEEE major organizational units at all leadership levels, Loretta Arellano has shown remarkable initiative in identifying and developing opportunities to carry out the Institute's mission of advancing technology for the benefit of humanity. Balancing her professional career—where she was an expert in reliability, maintainability, and logistics at Raytheon Company—with her IEEE service, Arellano has inspired teams and promoted cooperation among IEEE organizational units. In 2013, she was instrumental in meeting the IEEE Member and Geographic Activities (MGA) Board's goal of modernizing the volunteer experience. Recognizing a need to train promising volunteers, she proposed and created what is now known as the Volunteer Leadership Training Program (VoLT) to identify and develop leaders from the ranks of IEEE's local organizational units. The program introduces aspiring leaders to leadership skills and all aspects of IEEE operations and involving each of IEEE's major organizational units. Each VoLT trainee is assigned a mentor who shepherds the volunteer through a practical project designed to provide practical leadership experience. The volunteer participates in interactive webinars along with completion of a leadership project. The end result is a volunteer who is prepared to assume higher levels of responsibility in leading IEEE activities. For better efficiencies of staff and volunteer resources, Arellano also implemented a plan to integrate the MGA's training activities into a single committee, providing a one-stop approach to volunteer training and leadership development. She merged VoLT, the IEEE Center for Leadership Excellence (CLE), and the MGA Training Committee into one committee whose mission is to focus on all aspects of volunteer training. Among her many positions, she has served as Region 6 Director, Division 6 Director, and was president of the IEEE Reliability Society.

An IEEE Senior Member and an Institute for the Advancement of Engineering Fellow, Arellano is senior manager (retired) with Raytheon. She lives in Sun Valley, CA, USA.

Scope: For outstanding volunteer service to the IEEE.

IEEE Honorary Membership

Sponsored by IEEE



Anton Zeilinger

For pioneering conceptual and experimental contributions to the development of quantum communications and encryption

A visionary quantum physicist and a pioneer of quantum information science, Anton Zeilinger has helped shape the future of quantum technologies, including quantum communications. Quantum communications will play an important role in protecting information channels against eavesdropping by using quantum cryptography. He has performed many groundbreaking experiments in quantum mechanics, from important fundamental tests all the way to innovative applications. Most of his research concerns the fundamental aspects and applications of quantum entanglement. He discovered (with Greenberger and Horne), and later realized in experiments, the first multiparticle entangled states. These have since become essential in fundamental tests of quantum mechanics and in quantum information science, most notably in quantum computation. Among the innovative applications he and his group developed are the first entanglement-based quantum cryptography, quantum teleportation of independent photons, key concepts in optical quantum computation, the one-way quantum computer, and novel entanglement-based imaging methods. Quantum teleportation involves sending quantum information where the exact state of an atom or photon can be transmitted exactly from one location to another, with the help of classical communication and previously shared quantum entanglement between the sending and receiving locations. With his team, he also realized a few of the first long-distance entanglement-based quantum communication experiments, first across the Danube River in Vienna and later in many experiments between the Canary Islands. He has developed various schemes of quantum cryptography, demonstrating photonic key distribution in optical fibers as well as through free space. He also performed numerous tests of Bell's inequality, closing more loopholes and thus making quantum cryptography unconditionally secure. Recent work, in cooperation with the Chinese Academy of Sciences, includes the establishment of the world's first intercontinental quantum cryptography link via the quantum satellite Micius.

Recipient of the inaugural Isaac Newton Medal from the United Kingdom's Institute of Physics (2008), Zeilinger is a professor of physics at the University of Vienna and president of the Austrian Academy of Sciences, Vienna, Austria.

Scope: For those who have rendered meritorious service to humanity in the IEEE's designated fields of interest and who are not members of the IEEE.

IEEE Honorary Membership

Sponsored by IEEE

Mike Lazaridis

For revolutionary contributions to wireless communication and visionary leadership in fostering the advancement of fundamental physics toward future innovation

From smartphones to quantum computing, Mihal (Mike) Lazaridis has been a catalyst at the heart of the most important technological developments of our time. His creativity, entrepreneurial spirit, and belief in the power of basic science as a transformative tool have put him at the forefront of innovation. Lazaridis founded Research in Motion in 1984, which became BlackBerry, where he developed one of the world's first smartphones and in the process revolutionized personal mobile communications. Since its invention and evolution, the BlackBerry device has pushed the advancement of wireless communication, mobile computing, and computer security. Lazaridis turned his passion for theoretical physics into the Perimeter Institute for Theoretical Physics, which he established in 2000. The Institute has been widely recognized as a leading international center for physics research, training, and outreach. He also founded the Institute for Quantum Computing (IQC) at the University of Waterloo, which is dedicated to the experimental foundations of the quantum computer. He has donated more than US$170 million to Perimeter, and more than US$120 million to the IQC. In March 2013, Lazaridis launched Quantum Valley Investments (QVI) with US$100 million to provide financial and intellectual capital for the development and commercialization of quantum physics and quantum computing breakthroughs. QVI aims to help transform ideas and early stage breakthroughs into commercially viable products, technologies, and services. QVI has been instrumental in realizing Lazaridis' goal of creating in Waterloo a "Quantum Valley" to rival Silicon Valley by bringing the world's best minds in physics, engineering, mathematics, computer science, and materials science together to collaborate on cutting-edge quantum research. Lazaridis has helped put Waterloo on the map as a recognized high technology center for physics and innovation that is fueling the next revolution in quantum physics.

A Fellow of the Royal Society of London and Royal Society of Canada and member of the Consumer Technology Hall of Fame, Lazaridis is managing partner of Quantum Valley Investments, Waterloo, Ontario, Canada.

Scope: For those who have rendered meritorious service to humanity in the IEEE's designated fields of interest and who are not members of the IEEE.

IEEE Robert N. Noyce Medal

Sponsored by Intel Foundation

Tsugio Makimoto

For technical and managerial leadership in CMOS memory and microprocessors

The driver of the semiconductor industry's revolutionary shift from NMOS (N-channel metal oxide semiconductor) to CMOS (complementary metal oxide semiconductor), Tsugio Makimoto's technical expertise and vision have led to the commercialization of high-speed memories and microprocessors that enable the digital consumer electronics we take for granted today. Makimoto helped develop and commercialize the world's first high-speed 4K/16K CMOS static random-access memory (SRAM) based on twin-well structure technology. He then developed a high-speed CMOS microprocessor unit (MPU) that was as fast as its NMOS counterpart, but which operated at much less power. This was instrumental in the industry's transition from NMOS to CMOS, with production of integrated circuits for logic, dynamic RAM, and flash memory switching to CMOS processes under his leadership. Most of today's electronic devices are based on CMOS technology. Makimoto is also noted for developing field-programmable MPUs with embedded flash memory, which substantially shortened the time to market for new products. His leadership in promoting high-performance, low-power reduced instruction set computer (RISC)-based MPUs was instrumental in creating the digital consumer market segment to provide the digital cameras, hand-help PCs, and other powerful portable devices that proliferate our society today and enable our mobile lifestyle. Makimoto has also provided the semiconductor industry with a valuable tool for predicting trends and developing strategies. He recognized that there is a cyclical nature to the semiconductor industry where, over time, there would likely be an oscillation between customized and standardized products. He theorized that over a 10-year period, key forces such as differentiation, value-add, operational efficiency, cost effectiveness, and time to market would drive this oscillation. This became known as "Makimoto's Wave," and it contributed to the rise of the field-programmable gate arrays. Makimoto also helped establish the World Semiconductor Council to promote international cooperation among semiconductor associations from around the globe.

An IEEE Life Fellow and recipient of 2004 Bellwether Award and 2013 Global IT Award, Makimoto is the president of Technovision, Tokyo, Japan.

Scope: For exceptional contributions to the microelectronics industry.

IEEE Edison Medal

Sponsored by Samsung Electronics Co., Ltd.

Eli Yablonovitch

For leadership, innovations, and entrepreneurial achievements in photonics, semiconductor lasers, antennas, and solar-cells

The technologies developed by Eli Yablonovitch affect anyone who uses a mobile phone or searches the Internet. Yablonovitch proposed that semiconductor lasers should be strained, in order to benefit from reduced valence band (hole) effective mass. Today, with almost every human interaction with the Internet, optical telecommunication occurs by strained semiconductor lasers. Most likely, billions of people are unknowingly using his idea every time they connect to the Internet, make a phone call, or check e-mail. In his photovoltaic research, Yablonovitch's $4n^2$ light-trapping factor is in worldwide use for almost all commercial solar panels. Known as the Yablonovitch Limit, this factor increased the theoretical limits and practical efficiency of solar cells. To the extent that solar electricity is blended with other power sources, there are billions of people unknowingly taking advantage of the Yablonovitch Limit. In his photonics work, Yablonovitch unified Maxwell's Equations and Schrodinger's Equation through the concept of the photonic crystal. The geometrical structure of the first experimentally realized photonic bandgap is often called Yablonovite. His invention of photonic crystals unifies optics, solid-state physics, electromagnetics, and quantum optics. Among other applications, photonic crystals are used in telecommunications, particularly in polarization-splitting two-dimensional grating couplers—which are a critical part of silicon photonic integrated circuits. His original paper on photonic crystals has been cited over 10,000 times and is the second-most-cited paper in the history of *Physical Review Letters*. Yablonovitch has cofounded four science-based companies, including Ethertronics, which became a major independent cellphone antenna manufacturer, having shipped over 2 billion antennas.

An IEEE Fellow and member of both the U.S. National Academy of Engineering and National Academy of Sciences, Yablonovitch holds the James and Katherine Lau Chair in Engineering and is a professor with the Electrical Engineering and Computer Sciences Department at the University of California, Berkeley, Berkeley, CA, USA.

Scope: For a career of meritorious achievement in electrical science, electrical engineering, or the electrical arts.

IEEE Alexander Graham Bell Medal

Sponsored by Nokia Bell Labs

Nambi Seshadri

For contributions to the theory and practice of wireless communications

Nambi Seshadri's pioneering research and commercial intuitiveness have impacted multiple generations of mobile and wireless communications and have helped make technology more affordable for consumers. While at AT&T Shannon Labs, one of Seshadri's key research initiatives was his work on transmission and coding techniques using multiple transmit antennas. This helped create a new field of wireless communications called space-time coding that improved the reliability of data transmission. An earlier version of this work that he did at AT&T Bell Labs, called delay diversity, was an important component of the 2G cellular time-division multiple access systems and has also impacted WiFi and LTE systems. His contributions to reliable transmission of compressed speech over mobile radio channels also influenced the development of 2G cellular systems. He also drove the adoption of adaptive modulation and hybrid automatic repeat request techniques (important for high performance in time varying channels) in to the Enhanced Data Rates for Global Evolution (EDGE) standards. These techniques have become core to robust transmission in 3G and 4G systems around the world. His work on list Viterbi decoding and applications for combined speech and channel decoding as well as data transmission systems have been applied to improve speech quality in 2G and 3G systems. Following his career at AT&T Bell Labs and AT&T Shannon Labs, Seshadri helped build Broadcom into a significant player in the wireless market. Here, he initiated or nurtured projects such as short-range wireless, WiFi modems in phones, cellular modems, GPS, near-field communications, and the multimedia chip set strategy that resulted in pioneering products such as the high-definition video camcorder and advanced megapixel camera phones. Through his leadership, the company was able to reduce prices while improving the performance of wireless chipsets. This system-on-chip integration of applications processing, graphics, haptics, WiFi, Bluetooth, camera, and 2G/3G/4G modems has impacted the industry by making smart phones much more affordable.

An IEEE Fellow and member of the U.S. National Academy of Engineering, Seshadri is a professor of electrical and computer engineering at the University of California, San Diego, San Diego, CA, and consulting CTO at Quantenna Communications, San Jose, CA, USA, in addition to serving as an advisor for several startups.

Scope: For exceptional contributions to communications and networking sciences and engineering.

IEEE Founders Medal

Sponsored by the IEEE Foundation

Narayana Murthy

For visionary leadership at Infosys contributing to human progress through technology and for advancing corporate ethics and social responsibility

Narayana Murthy's leadership in guiding Infosys from a start-up into a software engineering giant has served as the foundation of India's role as a global superpower in information technology, and he has used the company's success to give back to his native country. Murthy founded Infosys with six other colleagues in 1981 and developed it into what is today a US$35 billion software services company that has helped reshape the economic and social fabric of India. Key to the company's success was Murthy's Global Delivery Model (GDM), which is based on collaborative software development resulting in the on-time delivery of superior quality products to global customers within budget. GDM is the backbone of the Indian software industry and integral to the information technology outsourcing revolution. Under Murthy, Infosys became a role model for strong execution, product quality, corporate governance, and ethical practices with a culture of honesty, fairness, transparency, and meritocracy. Infosys' pioneering stock options plan ensured that employees fully shared in the company's success. Murthy also instituted an in-house training facility to provide quality skill development opportunities to keep up with rapid advances in technology. A generous philanthropist both institutionally and personally, Murthy established the Infosys Foundation to utilize a percentage of corporate profits to promote education, health, social welfare, destitute care, and culture programs in India. Through the Infosys Foundation, Murthy and his family have contributed heavily to assist the very poorest through access to better food, water, hygienic living conditions, education, and jobs. The Foundation has created libraries for poor children in 15,000 villages, has built hospitals and donated many sophisticated medical instruments, and has supported the largest free-lunch program in the world. Now retired, Murthy remains a strong voice for corporate ethics and social responsibility worldwide, while promoting stronger institutional governance in India.

An IEEE Honorary Member and fellow of the Indian National Academy of Engineering, Murthy is the founder of Infosys, Bengaluru, India.

Scope: For outstanding contributions in the leadership, planning, and administration of affairs of great value to the electrical and electronics engineering profession.

IEEE Richard W. Hamming Medal

Sponsored by Qualcomm, Inc.

Erdal Arikan

For contributions to information and communications theory, especially the discovery of polar codes and polarization techniques

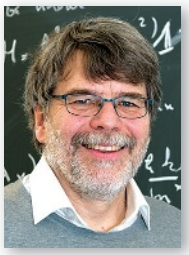
Erdal Arikan's groundbreaking work on channel polarization coding methods for achieving maximal channel capacity in digital communications has revolutionized information and communications theory by meeting the challenges of Shannon's limit for determining the maximum rate that data can be sent with zero error. A culmination of over 20 years of research, in 2009 Arikan described the concept of channel polarization and a completely new, remarkably clear method of data coding for transmission over symmetric channels with binary input. Considered one of the most powerful developments in coding theory of the past decade, his discovery of using polar codes for error correction was a major step in determining the limit at which reliable and efficient transmission of data over noisy channels is possible. Enhancing the original application to binary-input channels, Arikan extended his codes to channels with arbitrary input size to enable broader applications. His framework has proven to be flexible and adaptable to the parameters of communication channels, allowing researchers to construct polar coding schemes for a large range of block lengths and information transmission rates. His polar codes also feature simple iterative schemes of data encoding and decoding to allow efficient hardware implementation. His work has also been extended to polar codes for channels that are not necessarily symmetric, dual polar codes for data compression, and polar codes for data hiding with information-theoretic security guarantees. Initially met with skepticism by practitioners due to major obstacles preventing their practical use, Arikan's polar codes have evolved in a short time to become an integral component of emerging wireless standards for enhanced mobile broadband (eMBB) control channels in 5G New Radio (NR) interfaces, with a major wireless company recently demonstrating 27 Gbps in 5G field-trial tests.

An IEEE Fellow and recipient of the 2013 IEEE W.R.G. Baker Award, Arikan is a professor with the Department of Electrical Engineering at Bilkent University, Ankara, Turkey.

Scope: For exceptional contributions to information sciences, systems, and technology.

IEEE Medal for Environmental and Safety Technologies

Sponsored by Toyota Motor Corporation



Jerome Faist and Frank K. Tittel

For pioneering contributions to the quantum cascade laser and optical chemical sensors for environmental sensing

The numerous direct and indirect collaborations between Jerome Faist and Frank K. Tittel have made quantum cascade laser (QCL) spectroscopy an established, more powerful, and versatile chemical detection tool for trace chemical sensing in environmental, medical, and security applications. Faist developed the QCL in 1994, providing a fundamentally new semiconductor laser that could operate in the mid-infrared and terahertz wavelength range. He then created the first single-mode laser suitable for spectroscopy in 1997. Faist has continuously advanced QCLs with innovations expanding the wavelength range, improving efficiency, developing theoretical models underpinning their properties, and expanding their applicability by improving room-temperature operation. Tittel had already been a leading researcher in several fields related to vibrational spectroscopy, especially in the development of new light sources and spectroscopy systems. With Faist's invention of the QCL, Tittel was eager to the adapt the technology to environmental monitoring and medical diagnostics. In 2004, Faist supplied Tittel with one of the first QCLs cooled only by a thermoelectric cooler operating in the 9-μm region, which Tittel used to observe the absorptions of several species. Then Faist developed a broadly tunable QCL with an antireflection coating enabling external cavity tuning, which Tittel incorporated into a broad scanning source for his spectroscopic applications. One of the most important techniques developed in Tittel's lab was quartz-enhanced photoacoustic spectroscopy (QEPAS). In this method, absorption of a modulated laser beam by a tiny sample of gas excites the resonance of a quartz tuning fork. By combining QEPAS with a QCL, Tittel produced a very compact and portable trace gas monitor with high sensitivity and stability that was readily deployable to the field. QCL-based sensors developed by Tittel have been shown to detect trace amounts of methane and nitrous oxide at landfills. Overall, Faist and Tittel have provided the global climate research community with tools to solve critical problems of unprecedented complexity.

An IEEE Member, Optical Society of America Fellow, and recipient of the 1994 American Association for the Advancement of Science's Newcomb Cleveland Prize, Faist is a professor with the Department of Physics at ETH Zurich, Zurich, Switzerland.

An IEEE Fellow and Optical Society of America Fellow, Tittel is the J.S. Abercrombie Professor in Electrical and Computer Engineering at Rice University, Houston, TX, USA.

Scope: For outstanding accomplishments in the application of technology in the fields of interest of IEEE that improve the environment and/or public safety.

IEEE Jack S. Kilby Signal Processing Medal

Sponsored by Texas Instruments, Inc.

Bede Liu

For sustained contributions to the analysis and the development of low-complexity realizations of digital signal processing algorithms

Bede Liu's pioneering work on signal processing focused primarily on lowering implementation complexity and reducing power consumption, which have been central to the creation of cost-effective, high performance, low-power signal processing, important in the development of mobile and multimedia systems. To battle the cost of implementing digital signal processing algorithms, Liu developed novel methods that require much less computation by replacing computation with memory. His revolutionary approach of incorporating simple shift-and-adds for multiplier-free filters provides a 3-to-1 savings in computation over the traditional methods, thus enabling highly efficient implementation of digital filters and the fast Fourier transform algorithm. Multiplier-less processing has been widely used and commercialized in chips for control and imaging applications, dynamic signal analyzers, and a discrete cosine transform chip that was the fastest at the time. Liu's proposal to use 1-bit coefficients on over-sampled data achieved significant savings in chip area and power. This approach is now widely used to allow for tradeoffs among clock rate, area, and power consumption in implementations for applications including mobile information devices. In video coding, Liu's novel way to determine motion vectors that reduces computation by a factor of 4 was incorporated in software packages and also led to a number of other proposed efficient approaches. In video analysis, his proposal to use reduced resolution processing to extract video content cuts computation by two orders of magnitude. He also developed novel ways of transcoding the conversion of an encoded video bit stream to another with a smaller bit rate in order to adapt to network conditions.

An IEEE Life Fellow and member of the U.S. National Academy of Engineering, an academician of Academia Sinica (Taipei), and a foreign member of the Chinese Academy of Sciences (Beijing), Liu is a Professor Emeritus with the Department of Electrical Engineering at Princeton University, Princeton, NJ, USA.

Scope: For outstanding achievements in signal processing.

IEEE Medal for Innovations in Healthcare Technology

Sponsored by the IEEE Engineering in Medicine and Biology Society

Thomas F. Budinger

For pioneering contributions to tomographic radiotracer imaging

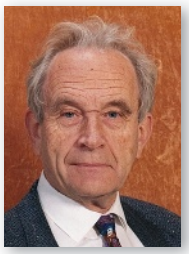
Thomas F. Budinger's groundbreaking work has defined how radiation can be safely applied to medical imaging, enabling the development of positron emission tomography (PET) and single photon emission computed tomography (SPECT) radiotracers critical to investigating conditions including cancer, heart disease, Alzheimer's disease, and brain injury. His research group at the Lawrence Berkeley National Laboratory has made world-class contributions in the fields of radiotracer development, radiotracer imaging, and tomographic image reconstruction. Budinger pioneered the use of the ^{82}Rb generator for heart imaging, which was commercialized under the brand name CardioGen-82, for clinical use. He performed the first SPECT dynamic imaging study of the human heart, which required a novel combination of list-mode data acquisition, cardiac gating, attenuation measurements of the spatially inhomogeneous human chest, and tomographic reconstruction. Budinger's team created the *Primer on Reconstruction Algorithms*, which was distributed worldwide during the late 1970s and 1980s, allowing scientists and students to gain hands-on experience in computed tomography using radionuclides or X-rays. This work also led to the quantitative understanding of how time-of-flight could be used in PET and how the statistical noise in reconstructed PET images could be reduced as the timing resolution was improved. These concepts are found in PET scanners being used today. Under his leadership, the construction of the PET 280 and the PET 600 scanners demonstrated how the limits of PET resolution could be approached. The PET 600 was constructed using 600 individually paired detectors and photomultiplier tubes to obtain a landmark 2.3-mm resolution. Budinger was a key player in the development of the Committee on Medical Internal Radiation Dose (MIRD) guidelines for safe use of radiopharmaceuticals. The *MIRD Primer* was published in 1988, providing outlined models and methods for determining organ dosimetry. He described, from biophysical principles and experiments, the safety of magnetic resonance imaging that is leading to human studies at 10 Tesla and beyond.

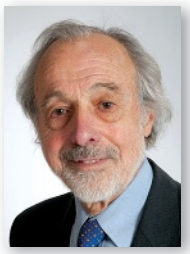
An IEEE Life Member and member of both the U.S. National Academy of Medicine and National Academy of Engineering, Budinger is a professor of bioengineering at the University of California, Berkeley, Berkeley, CA, USA.

Scope: For exceptional contributions to technologies and applications benefitting healthcare, medicine, and the health sciences.

IEEE/RSE James Clerk Maxwell Medal

Sponsored by the IEEE Foundation





Thomas Haug and Philippe Dupuis

For leadership in the development of the first international mobile communications standard with subsequent evolution into worldwide smartphone data communication

The groundbreaking contributions of Thomas Haug and Philippe Dupuis in developing the Global System for Mobile Communications (GSM) set the international policy framework responsible for the success and continued advancement of international mobile communications. Haug's experience in developing the Nordic Mobile Telephone project, a 1G analog system that was the first example of international roaming among mobile phone users in Sweden, Norway, Denmark, and Finland, helped pave the way to developing GSM. Serving as chair of the Special Mobile Group of the European Conference of Postal and Telecommunications Administrations (CEPT), Haug was tasked with finding a consensus on 2G digital technology for mobile communications. GSM would be the solution. Dupuis led the Franco-German cooperation program that demonstrated digital technologies were mature enough to build the GSM system. Dupuis strongly supported using slow frequency hopping, which later allowed operators to manage the huge growth of traffic with reduced impairments to the quality of service. This enabled GSM to achieve performance equal or superior to competing digital systems. Under Haug's leadership, GSM allowed the first digital telephone call in 1992 between the Finnish prime minister and the mayor of Tampere. His initiatives also led to the inclusion of the SIM card and SMS text messaging. Dupuis is credited with moving GSM from concept to reality, and he followed Haug as chair of the Special Mobile Group. Dupuis also promoted a smooth transition concept that ensured the continuation of GSM as a foundation for 3G, 4G, and even today's emerging 5G standards. Haug's and Dupuis' development of GSM as a singular cellular standard to replace a plethora of competing national standards has stood the test of time in providing seamless service improvements for successful worldwide wireless communications.

Haug is the recipient of the 2013 Charles Stark Draper Prize from the U.S. National Academy of Engineering and is a former chairman of the Special Mobile Group of the CEPT (now the European Telecommunications Standards Institute), Sollentuna, Sweden.

Dupuis was awarded Knight distinction in France's National Order of the Legion of Honor (1989) and is a former chairman of the Special Mobile Group of the CEPT (now the European Telecommunications Standards Institute), Gif-sur-Yvette, France.

Scope: For groundbreaking contributions that have had an exceptional impact on the development of electronics and electrical engineering or related fields.

IEEE Jun-Ichi Nishizawa Medal

Sponsored by the Federation of Electric Power Companies, Japan

Joe C. Campbell

For contributions to the development of high-speed, low-noise, long-wavelength avalanche photodiodes

A leading innovator in the field of photonics, Joe C. Campbell's development and advancement of avalanche photodiodes (APDs) have raised the sensitivity of optical receivers to a new level to increase the amount of information that can be transmitted in high-bandwidth fiber-optic networks. Optoelectronic devices play an integral role in communication systems with lasers and photodetectors acting as information sources and receivers, and the APD has become the standard for long-haul, high-bitrate systems. APDs are also widely used in laser range finders, in biomedical imaging applications such as positron emission tomography, and in particle physics experiments. Beginning with his work at Bell Labs in the 1980s and continuing through his academic career at the University of Texas at Austin and the University of Virginia, Campbell has carried out groundbreaking work that has enabled the realization and advancement of high-performance APD-based fiber-optic receivers crucial to long-distance telecommunications links. Campbell was responsible for the initial design, fabrication, and experimental characterization of the APD, and he demonstrated the order-of-magnitude improvement in system performance that APDs enabled. He also demonstrated the critical importance of separate avalanche and detection (SAM), as well as the importance of charge (SACM) and grading (SAGM) layers in this design. He showed the importance of nonlocal effects and how APD receivers can be made superior to existing theories as a result of this effect in superlattice APDs. Campbell was the first to show that the multiplication noise of these high-speed APDs did not degrade for very thin multiplication regions. Campbell also modeled the noise and frequency response of the SAM-APD. His analytic treatment of the frequency response includes all the physical mechanisms that affect the speed. This model is widely accepted as the most accurate method to simulate the frequency response of the technologically important APD.

An IEEE Life Fellow and member of the U.S. National Academy of Engineering, Campbell is the Lucian Carr Professor of Electrical and Computer Engineering at the University of Virginia, Charlottesville, VA, USA.

Scope: For outstanding contributions to material and device science and technology, including practical application.

IEEE James H. Mulligan, Jr. Education Medal

Sponsored by MathWorks, Pearson, and the IEEE Life Members Fund

Delores M. Etter

For contributions to engineering through innovative textbooks on problem solving with computing languages and software tools

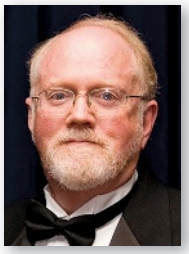
A pioneer in the field of computer education for engineers, Delores M. Etter's groundbreaking vision has produced some of the most influential educational works that have transformed and improved undergraduate engineering education in the fields of computers and programming. Etter has written more than a dozen textbooks that have helped educate hundreds of thousands of students worldwide. A unique characteristic of her textbooks is the focus on a consistent problem-solving methodology beyond just writing code. She refined her initial approach with feedback from hundreds of students over several years into a problem-solving technique based on five steps. Step 1 is to carefully describe the problem to be solved, because sometimes we start to solve a problem before we fully understand it. Step 2 is to define the input and the output to the problem. Step 3 is to work a simple problem by hand, since, if you can't do a simple problem by hand or with a calculator, you aren't ready to start writing a computer program. Step 4 is to develop an algorithm for the solution and convert it into a computer program (always start with a flowchart or pseudocode, even for simple problems). Step 5 is to test the program carefully (start with the solution you hand-worked in Step 3 and then move on to testing it with a variety of inputs, including invalid inputs). This five-step process is defined at the beginning of each of Etter's textbooks, and it is consistently used for every complete example throughout her texts. She has demonstrated that the technique works for computer languages ranging from MATLAB to Fortran to C++. New editions of her textbooks have been translated into different languages including Chinese, Japanese, Korean, Spanish, and Italian, benefitting students around the world.

An IEEE Life Fellow and member of the U.S. National Academy of Engineering, Etter is a Professor Emeritus with the Department of Electrical Engineering at Southern Methodist University, Dallas, TX, USA.

Scope: For a career of outstanding contributions to education in the fields of interest of IEEE.

IEEE Dennis J. Picard Medal for Radar Technologies and Applications

Sponsored by Raytheon Company



Mark E. Davis

For technical contributions to advanced aerospace multifunction microwave and foliage penetration radars, and for leadership within the radar community

Both a technical innovator and manager of some of the most advanced radar systems ever conceived, developed, and deployed, Mark E. Davis has established a sustained history of outstanding and pioneering contributions to radar systems, radar phenomenology, and radar signal processing. Davis led the team that developed a new generation of airborne microwave radars known as modular survivable radar (MSR), utilizing emerging technologies of monolithic microwave integrated circuits (MMIC) and very-large-scale integrated circuits (VLSI). A breakthrough in radar surveillance technology, MSR provided novel, multimode features that were vastly superior to competitive systems, such as achieving an order of magnitude improvement in mission reliability; performing multimode, simultaneous detection; and tracking of ground targets by employing ten independent sum and difference beams. It also enabled real-time synthetic aperture radar (SAR) and ground moving target indication (GMTI) radar mode operation. Responsible for the U.S. Air Force Science and Technology Plan for Space Based Radar (SBR) development, Davis transformed the SBR community from a collection of scientists into a team of specialists who develop state-of-the-art technology for the United States and its allies. He was also instrumental to the U.S. Defense Advanced Research Projects Agency (DARPA) Mountain Top Radar Program, which involved the collection of measured data for validating radar space-time adaptive processing (STAP) techniques. His contributions to industry include the development of critical electronic components and signal processing technologies that were ahead of their time, leading to highly sophisticated, advanced, multifunction radar technology for improved GMTI and real-time SAR capabilities. Davis' more recent activities include pioneering work on advancing foliage penetration (FOPEN) radar systems for improved detection and characterization of objects hidden by dense foliage. Davis authored the textbook *Foliage Penetration Radar: Detection and Characterisation of Objects Under Trees* (2011) and has been the IEEE Aerospace Electronics Systems Society's distinguished lecturer on foliage penetration and ultra-wideband radar since 2012.

An IEEE Life Fellow and recipient of the 2011 Warren D. White Award for Excellence in Radar Engineering, Davis is an international consultant through medavis consulting, Prospect, NY, USA.

Scope: For outstanding accomplishments in advancing the fields of radar technologies and their applications.

IEEE Medal in Power Engineering

Sponsored by the IEEE Industry Applications, Industrial Electronics, Power Electronics, and Power & Energy Societies

Hirofumi Akagi

For pioneering contributions to theory and practice of power conversion systems and their applications

One of the most prolific contributors to increasing the use of power electronics to benefit power systems, Hirofumi Akagi's pioneering work on power conversion techniques has led to energy-saving applications in industrial and residential systems and has been integral to advances in renewable energy systems, electric/hybrid vehicles, and energy storage. Akagi presented the first paper on the theory of instantaneous active and reactive power in three-phase circuits. Known as "p-q theory," Akagi applied it to a three-phase reactive power compensator consisting of switching devices without any bulky energy storage component. He also experimentally verified innovative operating characteristics that had until then been impossible to obtain through the application of conventional reactive-power theory in single-phase circuits. Considered a fundamental theory for three-phase circuits, Akagi's p-q theory has allowed students and power engineers to gain insight into the instantaneous concept of voltage, current, active power, and reactive power. It has provided breakthroughs in the control of static synchronous compensators and unified power flow controllers in high-voltage transmission systems, as well as pure and hybrid active filters. Akagi's work on developing the three-level neutral-point-clamped (NPC) inverter has impacted high-power converters for medium-voltage motor drives and grid-tied applications. Marking the beginning of multilevel converter technology, the NPC concept has been used around the world in photovoltaic inverters, general-purpose inverters, steel mill drives, and bullet trains. Akagi has tackled the detrimental effects of electromagnetic interference (EMI) encountered in power conversion systems with innovative research leading to active and passive filters for reducing conductive EMI and bearing current in motor-drive systems. Akagi is also well known for his innovations regarding pure and hybrid active filters for power conditioning.

An IEEE Fellow and recipient of the 2008 IEEE Richard H. Kaufmann Award, Akagi is a Distinguished Research Professor with the Department of Electrical and Electronic Engineering at the Tokyo Institute of Technology, Tokyo, Japan.

Scope: For outstanding contributions to the technology associated with the generation, transmission, distribution, application and utilization of electric power for the betterment of society.

IEEE Simon Ramo Medal

Sponsored by Northrop Grumman Corporation

Heinz Stoewer

For pioneering accomplishments in and technical leadership of space systems engineering, and for profound influence on teaching and practice of systems engineering

Heinz Stoewer's systems engineering approach to solving complex challenges has led to the successful implementation of important international space projects and has benefitted diverse industries. Stoewer was the European Space Agency's (ESA) first program manager for the Spacelab project, where he created a strong systems group. Spacelab was essentially a small reusable space station designed to fit within the cargo bay of the U.S. National Aeronautics and Space Administration's (NASA) Space Shuttle that consisted of pressurized modules, unpressurized pallets, and other hardware that could be reconfigured for specific missions. Stoewer's systems engineering approach was critical to the success of the project, where the Spacelab and Shuttle depended on each other for power, life support, thermal management, crew functions, and communication. In these efforts, he led the requirements, system definition, and interface negotiations between ESA and NASA. This work ultimately set the stage for U.S. and European cooperation on the International Space Station. Stoewer also founded the ESA's Systems Engineering and Programmatics Department, where he implemented an end-to-end systems engineering philosophy across ESA projects. He served as managing director of the German Space Agency's national space science and applications projects, which included important work on shuttle imaging radar and the gravity recovery and climate experiment. Stoewer was also founding director of Delft University of Technology's international master's degree program in space systems engineering, where he introduced the use of small satellite-based projects as an effective teaching and training tool for engineering students. Serving on the International Council on Systems Engineering (INCOSE), he helped to broaden the organization's global perspective beyond aerospace and added a commercial component to complement its original aerospace focus. For the past eight years, Stoewer has been a Distinguished Visiting Scientist at NASA's Jet Propulsion Laboratory, where he has helped transform their system capabilities into a modern model-based systems engineering set of assets.

A member of the International Academy of Astronautics and recipient of the NASA Administrator Public Service Award (1984 and 1995) and of the Medal of the German Bundesrat (Senate), Stoewer is president of Space Associates GmbH, Munich, Germany.

Scope: For exceptional achievement in systems engineering and systems science.

IEEE John von Neumann Medal

Sponsored by IBM Corporation

Patrick Cousot

For introducing abstract interpretation, a powerful framework for automatically calculating program properties with broad application to verification and optimization

With the introduction and development of abstract interpretation, Patrick Cousot has provided the computer programming industry with one of the most sweepingly influential and impactful tools in all of computing. Working with his wife Radhia (who passed away in 2014), Cousot's groundbreaking demonstration in 1977 of abstract interpretation was a fundamental paradigm shift that placed static program analysis on a mathematical footing so that researchers could reason about correctness. It is now the dominating approach to static program analysis and is pervasive in today's programming tools, including compilers and the interactive development environment. Abstract interpretation provides a foundation for performing automatic program analysis, where the goal is to obtain information about the possible states that a program passes through during execution, but without actually running the program on specific inputs. In compilers, it is used to gather information used to decide which optimizations to employ, thereby allowing programs to run faster. In software-engineering tools, it is used to provide feedback to programmers about a program's runtime properties, which helps them do a better job of developing, modifying, debugging, and testing programs. In verification tools, it is one of the key techniques used to show that a program never reaches a bad state, thereby establishing that the program is correct with respect to some property of interest. Verification has grown increasingly important as computers and microchip-based controllers have become pervasive, and it is especially crucial regarding critical systems, such as controllers in nuclear reactors, automobile-braking and airbag-deployment systems, and aircraft collision-avoidance systems. Cousot and his team developed the ASTRÉE software system to analyze C programs for the occurrence of runtime errors. ASTRÉE has been applied to many safety-critical applications, such as the flight-control software for the Airbus A340 and A380 aircraft.

An IEEE Member and recipient of the 2008 Humboldt Research Award and the 2014 IEEE Harlan D. Mills Joint Award, Cousot is the Silver Professor of Computer Science at the Courant Institute of Mathematical Sciences, New York University, New York, NY, USA.

Scope: For outstanding achievements in computer-related science and technology.

IEEE Medal of Honor

Sponsored by the IEEE Foundation

Bradford W. Parkinson

For fundamental contributions to and leadership in developing the design and driving the early applications of the Global Positioning System

A visionary leader in academia, industry, and the U.S. military, Bradford W. Parkinson's role in developing and advancing the Global Positioning System (GPS) has provided the world with technology we now take for granted and that impacts virtually all aspects of modern living. GPS has become an engine of economic development and the basis for countless applications that rely on accurate positioning and timing information. Parkinson was the chief architect of this satellite-based navigation system that works in any weather condition, anywhere in the world, 24 hours a day, to let us know precisely where we are—whether on land, at sea, or in the air. As a Colonel in the U.S. Air Force in 1973, Parkinson led the efforts to gain government approval of GPS and served as the first director of the GPS Joint Program Office. While GPS was originally funded solely by the military, Parkinson insured that certain GPS signals would be freely available for civil applications. Under his leadership, the GPS satellites were produced and launched in 44 months. Simultaneously, a ground control system was developed and deployed to upload the satellites. Also developed were eight different kinds of user equipment to demonstrate the capabilities of the new system, and Parkinson led extensive tests to confirm that GPS could meet its goals.

As a professor at Stanford University, Parkinson participated in the development of many innovative applications for GPS while leading a research group within the Center for Positioning, Navigation, and Time. His group successfully modified a commercial Boeing 737 for robotic aircraft landings. In 1992, this plane made 110 fully "blind" landings using GPS alone. They also developed the first precision robotic farm tractor controlled to an accuracy of approximately 2 inches on a rough field. This initiated the era of "autofarming" that is now a US$900 million-a-year worldwide market. The group also created the Wide Area Augmentation System (WASS) intended to enable aircraft to rely on GPS for all phases of flight, including precision approaches to any airport within its coverage area. WAAS can also improve accuracy of personal GPS devices. Parkinson also served as coprincipal investigator and program manager of the NASA/Stanford Relativity Gyroscope Experiment, which validated Einstein's general theory of relativity using orbiting gyroscopes. With GPS providing precision orbit control and measurement, the experiment verified two effects of general relativity never before tested with a mechanical apparatus.

Parkinson's technical, program management, and political expertise made the initial configuration of GPS a reality. He then worked tirelessly to ensure that GPS remains an effective and reliable military capability as well as a precise and reliable international utility supporting an ever-increasing array of civil applications. Today's mobile Long-Term Evolution (LTE) communications technology is essentially dependent on high-precision GPS timing for its operation. GPS is also integral to providing emergency services; marine, air, and automotive navigation; weather forecasting and tracking; and surveying and mapping applications.

An IEEE Life Fellow and corecipient of the 2003 Charles Stark Draper Prize, Parkinson is the Edward C. Wells Professor of Aeronautics and Astronautics Emeritus at Stanford University, Stanford, CA, USA.

Scope: For an exceptional contribution or an extraordinary career in the IEEE fields of interest.

IEEE TECHNICAL FIELD AWARDS

The following Technical Field Awards are presented at 2018 IEEE technical conferences

Also Featured in the Booklet

2018 IEEE TECHNICAL FIELD AWARD SPONSORS

IEEE Awards proudly acknowledges its 2018 Technical Field Award sponsors. These are some of the world's leading organizations, societies, and individuals whose generous support helps to recognize and promote technological advances for the benefit of humanity. Our partners include:

Brunetti Bequest
Robert and Ruth Halperin Foundation in Memory of Herman and Edna Halperin
Hitachi, Ltd.
Keithley Instruments, a Tektronix company
Leon K. Kirchmayer Memorial Fund
Motorola Solutions Foundation
NEC Corporation
Nokia Bell Labs
Nokia Corporation
Philips Electronics N.V.
Sony Corporation
Dr. Kiyo Tomiyasu
Wolong Electric Group
IEEE Antennas and Propagation Society
IEEE Electronics Packaging Society
IEEE Circuits and Systems Society
IEEE Computational Intelligence Society
IEEE Computer Society
IEEE Control Systems Society
IEEE Education Society
IEEE Electromagnetic Compatibility Society
IEEE Electron Devices Society
IEEE Engineering in Medicine and Biology Society
IEEE Geoscience and Remote Sensing Society
IEEE Industry Applications Society
IEEE Industrial Electronics Society
IEEE Instrumentation and Measurement Society
IEEE Intelligent Transportation Systems Society
IEEE Microwave Theory and Techniques Society
IEEE Nuclear and Plasma Sciences Society
IEEE Photonics Society
IEEE Power & Energy Society
IEEE Power Electronics Society
IEEE Robotics and Automation Society
IEEE Signal Processing Society
IEEE Solid-State Circuits Society
IEEE Standards Association
IEEE Vehicular Technology Society

IEEE Biomedical Engineering Award

Sponsored by the IEEE Circuits and Systems Society and IEEE Engineering in Medicine and Biology Society

Mark S. Humayun

For contributions to the bioelectric retinal implant

A pioneer in vision restoration, Mark S. Humayun's development of the Argus II bioelectric artificial retina is improving patient quality of life by restoring sight to the blind. The first and to date only artificial retina to be both approved by the U.S. FDA and receive the European CE mark, the device receives image data from an external camera that is wirelessly transmitted to an electronic array implanted on the retina, enabling patients who are blind to recover enough vision to see letters and large objects and navigate obstacles. Key to the realization of the implant was Humayun's ability to lead diverse teams of engineers and combine the unique elements of electrical/biomechanical engineering, optics, materials science, and miniaturization. Humayun's current focus with the implant is on providing color vision and the ability to read smaller text.

An IEEE Fellow, Humayun is a professor at the University of Southern California, Los Angeles, CA, USA.

IEEE Cledo Brunetti Award

Sponsored by the Brunetti Bequest

Siegfried Selberherr

For pioneering contributions to Technology Computer Aided Design

One of the founders of modern Technology Computer Aided Design (TCAD), Siegfried Selberherr has provided modeling and software development tools invaluable to the continued miniaturization of semiconductor devices. TCAD involves the use of computer simulation to develop and optimize semiconductor processing technologies. Selberherr developed MINIMOS for two-dimensional predictive simulation of the electrical characteristics of miniaturized devices to understand and control the short-channel effects and doping profiles encountered as device sizes shrink. MINIMOS was later enhanced for three-dimensional simulation to address energy transport and interface physics. He also created the ZOMBIE and PROMIS simulators, which incorporated mesh generation and programming interfaces. Selberherr then developed the Vienna Integrated System for TCAD Applications (VISTA) to combine both process and device simulation tools in a common framework.

An IEEE Fellow, Selberherr is a professor with the Institute for Microelectronics at the Technische Universität Wien, Vienna, Austria.

IEEE Control Systems Award

Sponsored by the IEEE Control Systems Society

John N. Tsitsiklis

For contributions to the theory and application of optimization in large dynamic and distributed systems

A leader in the effort to optimize and control large-scale dynamic and distributed systems, John N. Tsitsiklis' algorithmic innovations have made possible advances in diverse applications ranging from dynamic resource allocation to sensor networks and distributed computation. Dynamic programming, the central methodology behind sequential decision making and control, often suffers from the curse of dimensionality. Tsitsiklis' work is behind some of the most powerful methods for overcoming this challenge in settings such as reinforcement learning, path planning, and the pricing of complex financial derivatives. Furthermore, his early work on consensus algorithms and distributed and asynchronous computation is impacting modern large-scale optimization methods, network management, and distributed control.

An IEEE Fellow and a member of the U.S. National Academy of Engineering, Tsitsiklis is a Clarence J. Lebel Professor of Electrical Engineering at the Massachusetts Institute of Technology, Cambridge, MA, USA.

IEEE Electromagnetics Award

Sponsored by the IEEE Antennas and Propagation, IEEE Electromagnetic Compatibility, IEEE Geoscience and Remote Sensing, and IEEE Microwave Theory and Techniques Societies

Tatsuo Itoh

For contributions to electromagnetic modelling, artificial materials, microwave electronics, and antennas

With over 50 years of theoretical and technological innovations, Tatsuo Itoh is among the most respected experts in electromagnetics and microwave techniques. He extended electromagnetic simulation to high-frequency applications, developing models that allow inclusion of relevant interactions between microwave circuit elements, their packaging, and the electromagnetic environment. His comprehensive field-based approach to global modeling helped establish the system-in-package concept important to smart phones. Itoh's spectral domain method for microwave circuit analysis is one of the most popular techniques for computer-aided design of microwave components. Recent achievements include realizing metamaterials enabling leaky-wave antennas that can continuously scan from the backward wave region to the forward wave region as a function of frequency.

An IEEE Life Fellow, Itoh is the Northrop Grumman Chair in Electrical Engineering at University of California, Los Angeles, Los Angeles, CA, USA.

IEEE Electronics Packaging Award

Sponsored by the IEEE Electronics Packaging Society

William T. Chen

For contributions to electronics packaging from research and development through industrialization, and for his leadership in strategic roadmapping efforts

William T. Chen is a visionary strategist, lead mentor for innovation, and hands-on engineer. His leadership has led to industrialization of game-changing packaging technologies by enabling miniaturization, cost reduction, and performance enhancements for today's pervasive all-powerful electronic devices. They include development of copper wirebonds replacing gold interconnects, saving industry hundreds of millions of dollars a year and 2.5D packaging high-volume implementation, setting the standard for myriad interconnects in a small package space for applications including high-performance logic and memory. His strategic vision on fan-out wafer-level packaging is critical for meeting future demand for smaller, thinner, and faster electronic systems.

An IEEE Life Fellow, Chen is an ASE Fellow and senior technical advisor with ASE Group, Inc., Sunnyvale, CA, USA.

IEEE James L. Flanagan Speech and Audio Processing Award

Sponsored by the IEEE Signal Processing Society

Mari Ostendorf

For contributions to statistical and computational models for analysis, interpretation, and synthesis in speech and language processing

Mari Ostendorf has advanced the field of speech and language processing by combining pioneering advances in statistical modelling and machine learning with an understanding of the deeper structures in speech. In acoustic modeling, she developed stochastic segment models to overcome the limitations of hidden Markov models, allowing the use of richer feature sets. Ostendorf helped standardize the method for annotating prosodic events (the properties of syllables and larger units of speech such as intonation, tone, and rhythm), as a major contributor to the now standard "ToBI" method for labeling speech prosody, and demonstrated its utility for improving spoken language technology. She also created novel frameworks of language modeling that are effective in separating different contextual factors, significantly impacting language modeling for speech recognition.

An IEEE Fellow, Ostendorf is a professor of electrical engineering at the University of Washington, Seattle, WA, USA.

IEEE Fourier Award for Signal Processing

Sponsored by the IEEE Circuits and Systems Society and the IEEE Signal Processing Society

Peter Stoica

For broad contributions to research and education in statistical signal processing and its applications

Peter Stoica's extensive contributions have impacted virtually every important subject of modern statistical signal processing. He has made seminal contributions to a broad area of theoretical topics. In particular he has been hailed for his pioneering contributions to array processing and direction-of-arrival estimation techniques and to multi-input multi-output radar. His influential scholarly texts, *System Identification* and *Spectral Analysis of Signals*, have been used worldwide to educate many generations of students, and his more recent books on wireless communications and sequence design have been invaluable references for researchers in the field. Throughout his life-long career he has also been a leader in bringing innovative signal processing techniques to a wide spectrum of important applications including radar, nuclear magnetic resonance, breast cancer diagnosis, wireless communications, sensor networks, and exo-planet search in astronomy.

An IEEE Fellow, Stoica is a professor with Uppsala University, Uppsala, Sweden.

IEEE Andrew S. Grove Award

Sponsored by the IEEE Electron Devices Society

Gurtej Singh Sandhu

For contributions to silicon CMOS process technology that enable DRAM and NAND memory chip scaling

Gurtej Singh Sandhu's pioneering achievements concerning patterning and materials integration have enabled the continuation of Moore's Law for aggressive scaling of memory chips integral to consumer electronics products such as cell phones, digital cameras, and solid-state drives for personal and cloud server computers. Sandhu initiated the development of atomic layer deposition high-k films for DRAM devices and helped drive cost-effective implementation starting with 90-nm node DRAM. Extreme device scaling was also made possible through his pitch-doubling process, which led to the first 3X-nm NAND flash memory. Sandhu's method for constructing large-area straight-wall capacitors enabled the formation of double-sided capacitors that extended the scaling of important one-transistor, one-capacitor (1T1C) device technologies. His process for CVD Ti/TiN is still in use for making DRAM and NAND chips.

An IEEE Fellow, Sandhu is a Senior Fellow and director of Micron Technology, Inc., Boise, ID, USA.

IEEE Herman Halperin Electric Transmission and Distribution Award

Sponsored by the Robert and Ruth Halperin Foundation, in memory of Herman and Edna Halperin, and the IEEE Power & Energy Society

Jinliang He

For contributions to lightning protection of power transmission systems, including advancing analytic methods and innovation in line surge arresters

The advanced modeling tools and innovative equipment developed by Jinliang He are making drastic improvements in protecting high-voltage power transmission lines from the effects of lightning strikes. Using electromagnetic field theory, He developed lightning shielding failure analysis methods for extra- and ultra-high-voltage transmission lines that are more accurate than conventional electrogeometric analysis. Tackling the difficult subject of upward lightning leaders originating from the transmission lines, He's models more accurately simulate the real process of a lightning strike, enabling optimal design of overhead power lines to reduce lightning shielding failure events. He also pioneered polymeric surge arrestors that are smaller, lighter, and safer to better suppress overvoltage due to lightning strikes and to effectively reduce the cost of constructing ultra-high-voltage systems.

An IEEE Fellow, He is the Chang Jiang Scholars Distinguished Professor of China's Ministry of Education with the Department of Electrical Engineering at Tsinghua University, Beijing, China.

IEEE Masaru Ibuka Consumer Electronics Award

Sponsored by Sony Corporation

Linus Torvalds

For his leadership of the development and proliferation of Linux

Linus Torvalds is a Finnish-American software engineer and architect of the Linux operating system. Torvalds started writing Linux, an open UNIX-like kernel, while working on his master's degree while at the University of Helsinki. His freely shared work ignited a technical revolution that enabled anyone to have a web presence at very low cost and has made Linux the leading operating system for servers, supercomputers, netbooks, Internet networking equipment, embedded systems, and numerous personal devices. His collaborative development process in the Linux kernel is the key success of open source software. Linux is in billions of smartphones, powers most tablets, and underlies computer-enabled eyewear, thermostats, and kitchen appliances. Torvalds is also the original author of the "git" source control management system. To this day, he remains the technical lead developer of the Linux kernel project.

Torvalds is a Fellow at Linux Foundation, Portland, OR, USA.

IEEE Internet Award

Sponsored by Nokia Corporation

Ramesh Govindan

For sustained contributions to the dynamic analysis of the Internet (protocols, topologies, configurations) and the Internet of Things (sensor networks)

Ramesh Govindan's pioneering work on defining Internet topology, discovering how the many hosts, routers, and autonomous systems are connected, has been integral to the continued growth of the Internet. His Mercator mapping tool was one of the first network mappers and provided extensive views of the Internet's backbone. He was among the first to study the Border Gateway Protocol, identifying oscillation issues affecting network stability. Govindan is also one of the founders of the sensornet movement, important to developing the Internet of Things in which everyday objects are imbedded with sensors that enable constant monitoring and interaction. Notable here is his work on directed diffusion and development of the Tenet program for wireless sensing, which set the direction for continued research.

An IEEE Fellow, Govindan is the Northrop Grumman Chair in Engineering and a professor at the University of Southern California, Los Angeles, CA, USA.

IEEE Richard Harold Kaufmann Award

Sponsored by the IEEE Industry Applications Society

Greg Stone

For advancements in rotating machine insulation evaluation and testing

Greg Stone's role in creating the first widely used commercial online partial discharge (PD) instrument has benefited electric utility companies by providing advanced diagnostics for assessing the condition and the need for maintenance of aging power equipment. The challenge in detecting PD is being able to separate it from electrical noise prevalent in power systems. Stone's work made it possible to separate PD signals from noise to facilitate online measurements and enable assessment of the condition of a machine's insulation system. To achieve this, he characterized how PD and noise pulses propagate in machine windings and measured pulse shape characteristics. He then helped develop algorithms to enable the online monitoring. Stone's recent work has addressed the challenges of detecting PD in variable-speed drives to avoid premature failure.

An IEEE Fellow, Stone is a dielectrics engineer with (and co-founder of) Iris Power, L.P., Mississauga, Ontario, Canada.

IEEE Joseph F. Keithley Award in Instrumentation and Measurement

Sponsored by Keithley Instruments, a Tektronix company, and the IEEE Instrumentation and Measurement Society

David W. Allan

For leadership in time determination and precise timing instruments

Keeping time, or more precisely, keeping accurate time, has been the focus of David W. Allan's career. He developed a device to automatically remove systematic timing errors from quartz-crystal oscillators used for generating the United States' official time. He also created a dual-mixer time-difference measurement system with sub-picosecond precision for comparing atomic clocks. His GPS common-view timing receiver has been used to transfer time from timing centers around the world to the International Bureau of Weights and Measures for generating coordinated universal time (UTC) as the world's official time. His "smart-clock" method for enhancing GPS civil signals has been instrumental in synchronizing cell phone towers. The Allan Variance, Modified Allan Variance, and the Time Variance, which he developed, have become international standards for designing and constructing time and frequency equipment.

An IEEE Life Senior Member, Allan is president of Allan's TIME, Fountain Green, UT, USA.

IEEE Gustav Robert Kirchhoff Award

Sponsored by the IEEE Circuits and Systems Society

Alan Willson

For fundamental contributions to the theory and design of nonlinear circuits and signal processing systems

Alan Willson's seminal achievements over 50 years (many in collaboration with his Ph.D. students) have substantially enhanced theory and design in the fields of nonlinear circuits and digital signal processing (DSP). His nonlinear circuits research has produced fundamental theorems for transistor circuits that have lasting impact. He has also developed highly effective design techniques for finite impulse response digital filters. Willson's work on direct digital synthesizer technology, resulting in many patents through his company Pentomics, Inc., has had significant industrial application. In the early 1970s Willson also created the University of California, Los Angeles' first DSP courses and research projects.

An IEEE Life Fellow and U.S. National Academy of Engineering member, Willson is the Charles P. Reames Professor Emeritus at the University of California, Los Angeles, Los Angeles, CA, USA.

IEEE Leon K. Kirchmayer Graduate Teaching Award

Sponsored by the Leon K. Kirchmayer Memorial Fund

Mark S. Lundstrom

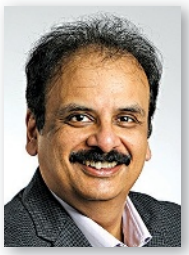
For creating a global online community for graduate education in nanotechnology as well as teaching, inspiring, and mentoring graduate students

Mark S. Lundstrom's innovative courses and pioneering online programs are transforming the way electronics is taught. Lundstrom created nanoHUB to provide online access to simulations of nano-materials and devices. He then developed nanoHUB-U to provide short courses that bring new insights and understanding from research to graduate education. More than 60,000 students from over 1,000 universities have registered for these courses. He complemented nanoHUB-U with the student-friendly Lessons from Nanoscience Lecture Notes series, which aims to rethink traditional topics, so that working from the nanoscale to the macroscale becomes natural and intuitive. In his work with students, Lundstrom instills the need for clear and concise communication and demonstrates the importance of intellectual honesty and modesty in everything a student or professional does.

An IEEE Life Fellow, Lundstrom is the Don and Carol Scifres Distinguished Professor of Electrical and Computer Engineering at Purdue University, West Lafayette, IN, USA.

IEEE Koji Kobayashi Computers and Communications Award

Sponsored by NEC Corporation



Victor Bahl

For contributions to broadband wireless systems

With seminal research achievements that have enabled the modern wireless Internet to become a reality, Victor Bahl has shaped the broadband access technologies we take for granted today, making Internet access more affordable, reliable, and globally available. Among his many important contributions, Bahl developed opportunistic networking and the world's first white space network. He was instrumental in the U.S. Federal Communications Commission's decision to open 180 MHz of spectrum for unlicensed use. His community wireless mesh networks implementing multi radio routers also brought affordable Internet access to rural communities. Other accomplishments include the first Wi-Fi hotspot; Wi-Fi based indoor localization systems, which showed how RF signals can be used for functionality beyond communications; and Virtual Wi-Fi available in today's computers and smartphones.

An IEEE Fellow, Bahl is a Distinguished Scientist with Microsoft Research, Redmond, WA, USA.

IEEE William E. Newell Power Electronics Award

Sponsored by the IEEE Power Electronics Society

Rainer Marquardt

For development of the modular multilevel converter application in medium drives and high-voltage DC transmission systems

A milestone achievement in power electronics, Rainer Marquardt pioneered the modular multilevel converter (MMC) concept, which has revolutionized the capabilities of power conversion technology. It has changed high-voltage DC (HVDC) conversion, which is important for future applications including electronically controlled transmission networks for long distances. MMC has become the most common type of voltage-source-controlled HVDC due to its scalability from the megawatt up to the gigawatt range, transformer-less operation, high efficiency, high reliability, and fault tolerance. Developed by Marquardt in 2002, the MMC has become important for medium-voltage drives, wind power and other applications, and regenerative energy sources. His MMC technology was successfully applied in the Trans Bay HVDC underwater cable connecting San Francisco, CA, to Pittsburg, CA. As a worldwide standard, MMC topology has extended the application field and the capabilities of power electronics significantly.

Marquardt is a professor with the University of Bundeswehr, Munich, Germany.

IEEE Daniel E. Noble Award for Emerging Technologies

Sponsored by the Motorola Solutions Foundation

Rajiv V. Joshi

For contributions to predictive failure analytics, VLSI memory design, and technology

Rajiv V. Joshi's innovations have revolutionized industrial techniques and products across many domains, including interconnect process technology, circuits, SRAM design, technology modeling, and CAD. He has overcome previously insurmountable barriers to scaling. Joshi's development and commercialization of statistical methodologies for variability analysis of novel memories and application of new technologies to SRAMs paved the way for widespread industrial adoption of statistical techniques. His innovations to interconnect processes and structures for multiple metallization technologies—aluminum, tungsten, and copper—have been widely used in IBM memory and logic processes. His developments have been broadly licensed and commercialized to the tune of hundreds of millions of dollars. They are engrained in every facet of our modern lives: in servers; low-power, hand-held devices; and the wearable computing market.

An IEEE Fellow, Joshi is a research staff member at IBM T. J. Watson Research Center, Yorktown Heights, NY, USA.

IEEE Donald O. Pederson Award in Solid-State Circuits

Sponsored by the IEEE Solid-State Circuits Society

William S. Carter and Stephen Trimberger

For contributions to field-programmable gate array technology

William S. Carter and Stephen Trimberger were pioneers at Xilinx, creating and refining an important new semiconductor product category—field-programmable gate-array (FPGA) technology, now a multibillion-dollar industry. Carter saw that Moore's Law would make FPGAs increasingly capable and useful and developed efficient circuits for implementing programmable logic. He designed the Xilinx XC2000 and XC3000 FPGAs and led the engineering effort on later versions. Trimberger's experiments on the architecture of the fabric and its influence on the performance of a user design as well as its impact on the design of the silicon was crucial in developing efficient FPGA architectures. Many features of this approach are now standard for all programmable logic manufacturers. Carter and Trimberger helped form a new industry with profound and beneficial societal impact. FPGAs are used in aerospace and defense; IC prototyping; audio/video and image processing; automotive, professional, and consumer electronics; data-center and high-performance computing; industrial control; security and surveillance; medical systems; and wired and wireless communications. Carter and Trimberger's technical leadership, innovation, and vision have been critical to making FPGAs as popular and important as they are today.

William S. Carter is retired in Los Gatos, CA, USA. An IEEE Fellow, Trimberger recently retired from Xilinx and lives in Incline Village, NV, USA.

IEEE Frederik Philips Award

Sponsored by Philips Electronics N.V.

Ian A. Young

For leadership in research and development on circuits and processes for the evolution of microprocessors

Ian A. Young revolutionized the design of microprocessor clocking circuitry by designing Phase Locked Loop (or PLL) clocking circuits that drove the performance of Intel Pentium and Intel Core processors from 50 MHz to over 3 GHz. This innovation contributed to the rapid increase in the speed performance of microprocessors through the 1990s while following Moore's Law scaling. PLL clocking circuits are among the most used analog components within microprocessor integrated circuit products. As a manager of SRAM design and analog circuit design teams, Young developed a "Process Development & Circuit Design Co-optimization Methodology" to optimize the microprocessor performance, process density, and yield. This co-optimization methodology has become a standard across the semiconductor industry to date.

An IEEE Life Fellow, Young is a Senior Fellow and director of exploratory integrated circuits at Intel Corporation, Hillsboro, OR, USA.

IEEE Photonics Award

Sponsored by the IEEE Photonics Society

Ursula Keller

For seminal contributions to ultrafast laser technology enabling important industrial applications and novel scientific breakthroughs

A pioneer in the field of ultrafast lasers, Ursula Keller has revolutionized photonics and enabled important scientific and industrial applications in physics, chemistry, and biology. Keller developed the semiconductor saturable absorber mirror (SESAM) for generating ultrashort pulses, which transformed femtosecond lasers from complex devices only used by specialists to reliable instruments suitable for use in any general-purpose scientific laboratory and industrial applications. Most ultrashort lasers today utilize her SESAM mode-locking technology for optical communication, precision measurements, microscopy, ophthalmology, and micromachining applications. Her work has also enabled the optical frequency comb revolution and the invention of the attoclock to resolve electron tunneling. Keller's development of carrier phase stabilization and frequency comb technology during the 1990s was integral to Hänsch and Hall's development of laser-based spectroscopy that garnered the 2005 Nobel Prize in Physics.

An IEEE Fellow, Keller is a professor in the physics department at ETH Zürich, Zürich, Switzerland.

IEEE Robotics and Automation Award

Sponsored by the IEEE Robotics and Automation Society

Matthew T. Mason

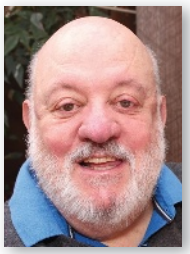
For scientific and educational contributions to the mechanics of manipulation enabling real-world robot autonomy, and for leadership in robotics

Matthew T. Mason's contributions to advancing the mechanics of grasping and manipulation are essential to enabling robots to physically interact with the world. A proponent of minimalism in robotic manipulation, his innovative thinking provides simple solutions that allow robots to perform sophisticated tasks, such as parts feeders used for automatic assembly and packaging. He established the geometrical and mechanical foundations for robotic manipulation, and he pioneered pushing and planar sliding as important processes in manipulation. As founder of Carnegie Mellon University's Manipulation Lab, Mason supervised development of the origami-folding robot, desktop mobile manipulators, scale-invariant grasping, throwing, striking, regrasp, and the use of simple single-actuator. He was also a key architect of the Robotics Roadmap that led to the National Robotics Initiative.

An IEEE Fellow, Mason is a professor of computer science and robotics at Carnegie Mellon University, Pittsburgh, PA, USA.

IEEE Frank Rosenblatt Award

Sponsored by the IEEE Computational Intelligence Society



Enrique H. Ruspini

For fundamental contributions to the understanding of fuzzy logic concepts and their applications

In a seminal 1969 paper, Enrique H. Ruspini provided the conceptual bases and tools for fuzzy clustering: the summarization and understanding of large data sets and complex objects as collections of fuzzy sets. In subsequent work, Ruspini defined methods that generalize fuzzy clustering by allowing the discovery of multiple, overlapping clusters of different nature and for recognizing important relations between those clusters. His work has led to numerous approaches for data representation and their application to fields ranging from image understanding to neurophysiology to genomics. His developments in the field of approximate reasoning led to a better understanding of methodologies for the analysis of systems described by uncertain data and to approaches to the intelligent control of autonomous robots and to pattern matching in databases (finding "needles" in data "haystacks").

An IEEE Life Fellow, Ruspini is currently an independent consultant residing in Palo Alto, CA, USA.

IEEE Marie Sklodowska-Curie Award

Sponsored by the IEEE Nuclear and Plasma Sciences Society

David Nygren

For pioneering radiation detector developments, enabling major discoveries in diverse areas of science

David Nygren's powerful particle-detection instruments are enabling breakthrough discoveries in physics and have improved practical applications such as medical imaging. Nygren developed the time projection chamber (TPC) to identify and track charged particles in complex high-energy collisions. Incorporating an intrinsically three-dimensional capability, the TPC has been implemented in particle colliders at major national research laboratories, has provided evidence of the gluon plasma state, and is playing a key role in searching for weakly interacting massive particles, in learning more about the elusive neutrino, and for many other applications. His proposal for fully depleted charge-coupled device imagers for optical astronomy are enabling a deeper view into space. Nygren's quantum-counting mammography system enables improved image quality while greatly reducing radiation exposure.

An IEEE Member, Nygren is a Presidential Distinguished Professor of Physics at the University of Texas at Arlington, Arlington, TX, USA.

IEEE Charles Proteus Steinmetz Award

Sponsored by the IEEE Standards Association

Craig M. Wellman

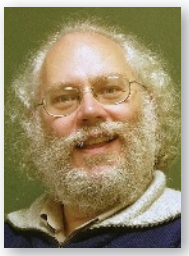
For leadership in developing and promoting standards that enable arc hazard assessment and injury-risk mitigation

A champion of improving electrical safety in the workplace, Craig M. Wellman's founding and chairing of the working group that developed the IEEE 1584-2002 standard for performing arc flash hazard calculations has reduced injuries and saved lives. This groundbreaking standard provides a method to predict the severity of arc flashes so that workers can wear appropriate arc-rated clothing or revise protective devices to reduce the hazards. Wellman volunteered to lead the 47-person working group through the process of reviewing available data, defining a test program, soliciting funds, conducting testing, analyzing data, developing a model, writing the standard, and working through the ballot process. Remarkably completed within two years, the standard has impacted the design of power system equipment, safe work practices, personal protective equipment, and worker training.

An IEEE Life Fellow, Wellman was employed by DuPont for thirty years and then worked as an independent consultant. He resides in Newark, DE, USA.

IEEE Eric E. Sumner Award

Sponsored by Nokia Bell Labs



Peter W. Shor

For contributions to quantum communication and information theory

Peter W. Shor's dramatic breakthroughs have fueled the modern quantum information revolution and ignited a global race to build the world's first practical quantum computer. Shor's 1994 integer factoring algorithm demonstrated that quantum computers could solve concrete and highly sensitive problems much faster than silicon computers. His algorithm also showed that encryption codes could be broken, which has had great implications for the security of classical communication systems. Shor proved skeptics of quantum communication wrong by pioneering the development of quantum error-correction codes to protect quantum states against decoherence and noise. His quantum accuracy threshold theorem provides confidence in the potential for constructing large-scale quantum computers since it guarantees that quantum computation is possible despite imperfections, provided the noise level is sufficiently low.

Shor is currently the Morss Professor of Applied Mathematics at the Massachusetts Institute of Technology, Cambridge, MA, USA.

IEEE Nikola Tesla Award

Sponsored by Wolong Electric Group, the IEEE Industry Applications Society, and the IEEE Power & Energy Society

Longya Xu

For contributions to design and control of efficient electric machines for wind power generation and electrified vehicles

Longya Xu's high-efficiency and high-reliability electric machine design and control techniques are driving advances in electric vehicles and in harnessing wind power. His development and enhancement of the first doubly fed brushless machine led to a sensorless and brushless wind-power generation system with high reliability compared to conventional motor and generator systems. He designed a brushless wind turbine generator that allows flexible AC or DC connection to power grids. Xu also developed the dual-mechanical-port (DMP) machine concept, which allows multiple mechanical subsystems to effectively interact with electrical subsystems for optimal performance and flexible power-flow control within a single electric machine frame. A major contribution to meeting the needs of high-efficiency electric vehicles, his DMP system was successfully installed on a 2.8-ton SUV capable of driving 125 km/hour at grades up to 30%.

An IEEE Fellow, Xu is a professor at The Ohio State University, Columbus, OH, USA.

IEEE Kiyo Tomiyasu Award

Sponsored by Dr. Kiyo Tomiyasu, the IEEE Geoscience and Remote Sensing Society, and the IEEE Microwave Theory and Techniques Society

J. Nicholas Laneman

For contributions to wireless network communication theory, algorithms, and architectures

At the forefront of modern communications research, J. Nicholas Laneman's contributions are driving the development of next-generation wireless networks that are reliable, spectrally efficient, and secure. An early proponent of cooperative communications and relaying techniques, Laneman's highly cited work has served as the foundation for one of the most active research areas in wireless communications. The concept involves mobile users in a wireless network cooperating with one another to convey their information to a common destination, relaying each other's information to provide more robust paths from sender to receiver. His research has been integral to both achieving higher date rates and extracting higher diversity from communications channels for more efficient and reliable communication.

An IEEE Fellow, Laneman is a professor of electrical engineering and founding director of the Wireless Institute in the College of Engineering at the University of Notre Dame, Notre Dame, IN, USA.

IEEE Transportation Technologies Award

Sponsored by the IEEE Industry Applications, Industrial Electronics, Intelligent Transportation Systems, Microwave Theory and Techniques, Power Electronics, Power & Energy, and Vehicular Technology Societies

C.C. Chan

For contributions to the advancement of electric vehicle technologies

One of the earliest international authorities on electric vehicles, C.C. Chan has been at the forefront of developing technologies enabling clean and efficient transportation methods benefiting the environment. Chan has made extraordinary contributions to the theoretical analysis and optimization of electric machines, power electronic devices, converters, special mechanical structures, and cooling systems that meet the special needs of electric vehicles including adaptive decoupling control, electromagnetic and thermal field analysis, hybrid architectures, and energy management. Considered the first comprehensive book on the topic, Chan's *Modern Electric Vehicle Technology* provided the fundamentals for modern electric vehicle technology, addressed key issues, and assessed their environmental impact. His recent research in smart charging and vehicle-to-grid systems has gained attention from not only automakers but also power utilities.

An IEEE Fellow, Chan is a professor with the University of Hong Kong's Department of Electrical and Electronic Engineering, Hong Kong.

IEEE Undergraduate Teaching Award

Sponsored by the IEEE Education Society

Susan M. Lord

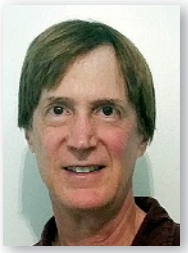
For contributions to the development of more inclusive and innovative undergraduate teaching in electrical and computer engineering

Considered by students and colleagues as an extraordinary educator and role model, Susan M. Lord is making engineering education more accessible and appealing to diverse students. At the University of San Diego (USD), Lord has coordinated redevelopment of the first-year engineering course multiple times to enhance student learning and improve retention. She also implemented laboratory programs for engineering design to foster continuous improvement. In her drive to make engineering education more welcoming to students of diverse backgrounds, she has conducted research to help faculty better understand who their students are, their pathways into engineering fields, and their classroom experiences. Lord was the first USD engineering faculty member to incorporate service learning where the students present hands-on science to middle- and high-school classes.

An IEEE Fellow, Lord is a professor and chair of engineering at the University of San Diego, San Diego, CA, USA.

IEEE Innovation in Societal Infrastructure Award

Sponsored by Hitachi, Ltd., and the IEEE Computer Society


David F. Ferraiolo, D. Richard Kuhn, and Ravi Sandhu

For advancing the foundations and practice of information security through creation, development, and technology transfer of role-based access control (RBAC)

The individual and combined efforts of David F. Ferraiolo, D. Richard Kuhn, and Ravi Sandhu in developing and strengthening role-based access control (RBAC) have provided the computer industry with the world's most widely used cybersecurity tool for protecting valuable digital data. Implemented at virtually all levels of computing, including operating system, database management, network, and enterprise management applications, RBAC overcame the limitations of previous security models based on military requirements that proved cumbersome for commercial industry needs. RBAC provides efficient security administration for large enterprises, simplified auditing of permissions to evaluate risk and regulatory compliance, efficient implementation of separation of duty rules to reduce insider threat risks, and scalability to some of the largest systems in existence.

Ferraiolo is manager of the Secure Systems and Applications Group, Computer Security Division, at the National Institute of Standards and Technology, Gaithersburg, MD, USA.

An IEEE Fellow, Kuhn is a computer scientist, Computer Security Division, at the National Institute of Standards and Technology, Gaithersburg, MD, USA.

An IEEE Fellow, Sandhu is the Lutcher Brown Endowed Chair in Cyber Security and executive director of the Institute for Cyber Security at the University of Texas at San Antonio, San Antonio, TX, USA.

2017 IEEE STAFF AWARDS

IEEE Eric Herz Outstanding Staff Member Award

Sponsored by IEEE

Mary Ward-Callan

For leadership of and service to IEEE volunteers, and for commitment and care in IEEE Technical Activities for the benefit of IEEE

Mary Ward-Callan is the staff executive at IEEE responsible for the strategic and operational leadership of the IEEE Technical Communities within the IEEE and of the Conference Line of Operation. The 47 Technical Societies and Councils, and numerous emerging technical communities, collectively deliver more than 1,000 conferences, 192 periodicals, countless technical training seminars, and several certification programs. Ward-Callan has been responsible for the programming and visibility of new technology areas within the IEEE, such as Internet of Things, Software Defined Networks, Rebooting Computing, 5G, and Big Data. She led the Award-winning IEEE Humanitarian Technology Challenge, a project that used solid engineering techniques to provide solutions to pressing world problems such as lighting Haiti/Africa/Nicaragua, providing data communications to healthcare facilities in Peru, and providing RFID patient identification in India.

An IEEE Senior Member, Ward-Callan is a certified association executive, is on the Vaughn College Board of Trustees, and is a member of the American Society of Association Executives.

Joyce E. Farrell IEEE Staff Award

Sponsored by IEEE

Jonathan Wiggins

For embodiment of the IEEE Professional Core and dedicated service to the IEEE

Jonathan Wiggins does a lot of things—from day-to-day management of IEEE's large copyright and trademark portfolio to overseeing matters involving social media, technology licensing, privacy law, and litigation. If it has anything to do with intellectual property, technology, or privacy, Wiggins is usually involved. He began his career at IEEE in 2011 in the Intellectual Property Rights Office. In the ensuing six years, he has developed an understanding of and strong relationship with IEEE's operations, staff, and members that has led to his ability to assist and support a wide variety of individuals from all IEEE organizational units on a number of different subjects. Jon believes in the value of respect for others, hard work, and equal collaboration with members of every team he is fortunate enough to be a part of.

Wiggins is currently the senior intellectual property attorney and chief privacy officer in the IEEE Legal and Compliance Department, New York, NY, USA.

The grade of IEEE Fellow recognizes exceptional distinction in the profession. It is conferred by the IEEE Board of Directors upon a person with an extraordinary record of accomplishments in any of the IEEE fields of Interest. The total number of IEEE Fellows elevated in any one year must not exceed one-tenth of one percent of the total voting membership of the IEEE on record as of 31 December of the preceding year. In 2018, 296 IEEE Fellows were elevated. To learn more about the Fellow program or to nominate, visit www.ieee.org/fellows.

Pieter Abbeel
University of California—Berkeley
Berkeley, CA, USA
for contributions to apprenticeship and reinforcement learning for robotics and autonomous systems

Pamela Ann Abshire
Silver Spring, MD, USA
for contributions to CMOS biosensors

Haithem Abu-rub
Texas A&M University
College Station, TX, USA
for contributions to power electronic converters for renewable energy applications

Erik Agrell
Chalmers University of Technology
Goteborg, Sweden
for contributions to coding and modulation in optical communications

Fauzia Ahmad
Temple University
Philadelphia, PA, USA
for contribution to through-the-wall radar imaging

Anastasia Ailamaki
Ecole Polytechnique Federale de Lausanne
Lausanne, Switzerland
for contributions to hardware-conscious database systems and scientific data management

Matteo Albani
Firenze, Italy
for contributions to the uniform geometrical theory of diffraction

Andrew Alleyne
University of Illinois
Urbana, IL, USA
for contributions to the control of thermal management systems

Pietro Andreani
Lund University
Lund, Sweden
for contributions to CMOS integrated voltage-controlled oscillators

Walid Aref
Purdue University
West Lafayette, IN, USA
for contributions to spatio-temporal database indexing and query processing

Kohtaro Asai
Mitsubishi Electric Corporation
Tokyo, Japan
for contributions to video coding development and standardization

Hajime Asama
University of Tokyo
Tokyo, Japan
for contributions to distributed autonomous robotic systems

Bertan Bakkaloglu
Arizona State University-Tempe
Scottsdale, AZ, USA
for contributions to radio frequency circuits

Bijnan Bandyopadhyay
IIT Bombay
Mumbai, India
for contributions to discrete-time, multi-rate, output feedback sliding-mode control

Paul Barford
University of Wisconsin
Madison, WI, USA
for contributions to Internet measurement and security

N. Scott Barker
University of Virginia
Charlottesville, VA, USA
for contributions to millimeter-wave and terahertz micromachining

Erik Blasch
US Dept. of Air Force
Rome, NY, USA
for leadership in aerospace information fusion systems

Glenn Boreman
University North Carolina at Charlotte
Charlotte, NC, USA
for contributions to optical and infrared antenna technologies

Vicente Boria
Universidad Politecnica de Valencia
Valencia, Spain
for contributions to high-power microwave filters and multiplexers

Timothy Boykin
University of Alabama
Huntsville, AL, USA
for contributions to atomistic models for semiconductor device simulation

Maurizio Bozzi
University of Pavia
Pavia, Italy
for contributions to substrate integrated waveguides and integrated periodic structures

Oliver Brock
Technische Universität Berlin
Berlin, Germany
for contributions to mobile manipulation and grasping

Alexander Bronstein
Tel Aviv University
Tel Aviv, Israel
for contributions to three-dimensional geometric processing in imaging

Charles Bunting
Oklahoma State University
Stillwater, OK, USA
for educational contributions to electromagnetic compatibility and reverberation chambers

Karen Butler-Purry
Texas A&M University
College Station, TX, USA
for contributions to expanding minority participation in power systems education

Marco Caccamo
University of Illinois at Urbana-Champaign
Urbana, IL, USA
for contributions to the theory and applications of hard real-time multicore computing

Yigang Cai
Naperville, IL, USA
for innovations in high-speed wireless networks

Giuseppe Calafiore
Politecnico di Torino
Torino, Italy
for contributions to probabilistic methods for robust control design

Jeffrey Calame
Annapolis, MD, USA
for contributions to high-power microwave and millimeter-wave amplifiers enabled by composite dielectric materials

Linda Camp
Indiana State University
Bloomington, IN, USA
for research in human-centered risk and security

Mark Campbell
Cornell University
Ithaca, NY, USA
for contributions to control and estimation theory for autonomous systems

Gustau Camps-Valls
Universitat de Valencia
Valencia, Spain
for contributions to machine learning in remote sensing

Emmanuel Candes
Stanford University
Stanford, CA, USA
for contributions to sparse and low-rank signal and image processing

Leo Casey
San Francisco, CA, USA
for contributions to high-speed power electronic interfaces for grid-tied distributed resources

Sherman Chan
Aspen Incorporated
San Mateo, CA, USA
for contributions to power system modeling and analysis tools for protective relaying

Chip Hong Chang
Nanyang Technical University
Singapore, Singapore
for contributions to hardware security

Kun-Yung Chang
Los Altos Hills, CA, USA
for contributions to transceivers for high-performance networking and high-density memories

Ni-Bin Chang
University of Central Florida
Orlando, FL, USA
for contributions to computational techniques for the analysis of environmental sustainability

Tsung-Yung Chang
Taiwan Semiconductor Manufacturing Company
Hsinchu, Taiwan
for application of SRAM technology to low-power and high-performance computing

Kuan-Neng Chen
National Chiao Tung Univeristy
Hsinchu, Taiwan
for contributions to 3D integrated circuit and packaging technologies

Wen-Hua Chen
Loughborough University
Loughborough, UK
for contributions to the applications of nonlinear disturbance observer based control

Yi-Jan Emery Chen
National Taiwan University
Taipei, Taiwan
for contributions to monolithic RF CMOS power amplifiers and transceiver frontends

Yiran Chen
Pittsburgh, PA, USA
for contributions to spintronic memory

Po-Tai Cheng
National Tsing Hua University
Hsinchu, Taiwan
for contributions to power converters for microgrid applications

Richard Chernock
Triveni Digital
Princeton, NJ, USA
for leadership in next generation digital TV

Yiu-Ming Cheung
Hong Kong Baptist University
Kowloon, Hong Kong
for contributions to cluster analysis and visual computing

Carla Chiasserini
Politecnico di Torino
Torino, Italy
for contributions to energy efficiency and cooperation in wireless networks

Gianfranco Chicco
Politecnico di Torino
Torino, Italy
for contributions to data analytics for smart metering

Gary Christensen
University of Iowa
Iowa City, IA, USA
for contributions to medical image registration and analysis

Oscar Cordon
University of Granada
Granada, Spain
for contributions to genetic and evolutionary fuzzy systems

Thomas Coughlin
San Jose, CA, USA
for leadership in consumer electronics digital storage technology

Jian Dai
King's College of London
London, UK
for contributions to reconfigurable and metamorphic mechanisms

Swaroop Darbha
Texas A&M University
College Station, TX, USA
for contributions to intelligent transportation systems and autonomous vehicles

Ewa Deelman
University of Southern California
Marina Del Rey, CA, USA
for contributions to scientific workflow management

Andreas Demosthenous
University College London
London, UK
for contributions to integrated circuits for active medical devices

Jaydev Desai
Georgia Institute of Technology
Atlanta, GA, USA
for contributions to medical and swarm robotics

Po Dong
Nokia Bell Labs
Holmdel, NJ, USA
for contributions to silicon-based photonic devices and integrated circuits

Qian Du
Mississippi State University
Mississippi State, MS, USA
for contributions to hyperspectral data processing

Alan Edelman
Massachusetts Institute of Technology
Cambridge, MA, USA
for contributions to the development of technical-computing languages

Lieven Eeckhout
Ghent University
Gent, Belgium
for contributions in computer architecture performance analysis and modeling

Karen Egiazarian
Tampere University of Technology
Tampere, Finland
for contributions to image and video denoising and restoration

Daniel Ellis
Columbia University
New York, NY, USA
for contributions to speech, audio, and music processing

Ehab El-Saadany
University of Waterloo
Waterloo, ON, Canada
for contributions to distributed generation planning, operation and control

Fariba Fahroo
Defense Advanced Research Projects Agency
Arlington, VA, USA
for contributions to computational optimal control theory

Liping Fang
Ryerson University
Toronto, ON, Canada
for contributions to multiple participant-multiple objective decision making and decision support systems

Hany Farid
Dartmouth College
Hanover, NH, USA
for contributions to digital forensics

Dario Farina
University Medical Center Göttingen
Göttingen, Germany
for contributions to neuromuscular electrophysiology and neurorehabilitation

Steven Feiner
Columbia University
New York, NY, USA
for contributions to augmented reality and computer graphics

James Feltes
Siemens Power Technologies
Schenectady, NY, USA
for contributions to modelling the dynamic response of power generation systems

Massimo Franceschetti
University of California-San Diego
La Jolla, CA, USA
for contributions to random wireless networks

James Friend
University of California-San Diego
La Jolla, CA, USA
for contributions to acoustics, microfluidics and microactuation

Pascal Frossard
EPFL-École polytechnique fédérale de Lausanne
Lausanne, Switzerland
for contributions to adaptive image and video representation, coding and communication

Kevin Fu
University of Michigan
Ann Arbor, MI, USA
for contributions to embedded and medical device security

Akira Fujiwara
NTT Basic Research Laboratories
Atsugi, Japan
for contributions to silicon single-electron devices

Thomas Furness
University of Washington
Seattle, WA, USA
for leadership in virtual and augmented reality

Andrea Galtarossa
Università degli Studi di Padova
Padova, Italy
for contributions to low polarization mode dispersion fibers

Dave Garrett
Tustin, CA, USA
for contributions to beam-forming architectures and implementations

Alexander Gelman
NETovations, LLC
Princeton, NJ, USA
for contributions to technologies for streaming and controlling digital video

Mounir Ghogho
Université Internationale de Rabat
Rabat, Morocco
for contributions to synchronization algorithms for communication systems

Maria Gini
University of Minnesota - Twin Cities
Minneapolis, MN, USA
for contributions to multi-agent programming in robotics

Yihong Gong
Xi'an Jiaotong University
Xi'an City, China
for contributions to pattern recognition and multimedia content analysis

Stefano Grivet-Talocia
Politecnico Di Torino
Torino, Italy
for contributions to passive macromodeling for signal and power integrity

Cuntai Guan
Nanyang Technological University
Singapore, Singapore
for contributions to brain-computer interfaces and applications

Xinping Guan
Shanghai Jiao Tong University
Shanghai, China
for contributions to stability analysis for time-delay fuzzy systems and intelligent control of nonlinear systems

Minyi Guo
Shanghai Jiao Tong University
Shanghai, China
for contributions to performance optimization and resource management of parallel and distributed systems

Yongxin Guo
National University of Singapore
Singapore, Singapore
for contributions to wideband printed antennas

Jung-Ik Ha
Seoul National University
Seoul, Korea
for contribution to sensorless control of AC drives

Martin Haardt
Ilmenau University of Technology
Ilmenau, Germany
for contributions to multi-user MIMO communications and tensor-based signal processing

Harald Haas
University of of Edinburgh
Edinburgh, UK
for leadership in the design of visible-light and wireless communication systems

Hashem Hashemian
Analysis and Measurement Services Corp.
Knoxville, TN, USA
for leadership in developing technologies for nuclear reactor monitoring

Haibo He
University of Rhode Island
Kingston, RI, USA
for contributions to adaptive learning

Tian He
University of Minnesota - Twin Cities
Minneapolis, MN, USA
for development and optimization of networked sensing systems

Jeffrey Herd
MIT Lincoln Laboratory
Lexington, MA, USA
for leadership in the development of low-cost phased array technology

Yoshihito Hirano
Mitsubishi Electric Corporation
Tokyo, Japan
for leadership in the development of 1.5-micron wind sensing lidar

Michel Houssa
University of Leuven
Leuven, Belgium
for contributions to materials characterization for advanced MOSFETs

Naira Hovakimyan
University of Illinois at Urbana-Champaign
Urbana, IL, USA
for contributions to control with applications to aerospace and robotic systems

Jonathan How
Massachusetts Institute of Technology
Cambridge, MA, USA
for contributions to guidance and control of air and space vehicles

David Howe
US National Institute of Standards & Technology
Boulder, CO, USA
for contributions to global time synchronization

David Hsu
National University of Singapore
Singapore, Singapore
for contributions to robot motion planning

Biao Huang
University of Alberta
Edmonton, AB, Canada
for contributions to and application of Bayesian soft-sensing for control performance monitoring

Qingming Huang
University of Chinese Academy of Sciences
Beijing, China
for contributions to multimedia content analysis and visual perceptual processing

Pan Hui
University of Helsinki
Hong Kong University of Science &Technology
Clear Water Bay, Hong Kong
for contributions to social-based opportunistic networks

Brad Hutchings
Brigham Young University-Provo
Provo, UT, USA
for contributions to CAD tools for reconfigurable computing

Jaroslav Hynecek
Allen, TX, USA
for contributions to solid-state image sensors

Kullervo Hynynen
Imaging Research
Toronto, ON, Canada
for contributions to image-guided therapeutic focused ultrasound

Leon Iasemidis
Louisiana Technical University
Ruston, LA, USA
for developments in epileptic seizure prediction and closed-loop brain stimulation

Anil Jampala
Alstom Grid, Inc.
Redmond, WA, USA
for contributions to the utilization of synchrophasors in energy management systems

Somesh Jha
University of Wisconsin-Madison
Madison, WI, USA
for contributions to the application of formal methods to security

Jiaya Jia
Chinese University of Hong Kong
Shatin NT, Hong Kong
for contributions to deblurring techniques in computational photography

Lynette Jones
Massachusetts Institute of Technology
Cambridge, MA, USA
for contributions to tactile and thermal displays

Sergei Kalinin
Oak Ridge National Laboratory
Oak Ridge, TN, USA
for leadership in piezoresponse force microscopy for nanoscale imaging

George Karypis
University of Minnesota-Twin Cities
Minneapolis, MN, USA
for contributions to graph partitioning and data mining

Aleksandar Kavcic
University of Hawaii
Honolulu, HI, USA
for contributions to signal processing and coding in data storage

Noriko Kawakami
Toshiba Mitsubishi-Electric Industrial Systems Corp.
Tokyo, Japan
for contributions to large-capacity power converters and applications

Thomas Kazior
Raytheon: Radio Frequency Components
Andover, MA, USA
for leadership in microwave and millimeter wave compound semiconductor technology and heterogeneous integration with silicon

Angelos Keromytis
Defense Advanced Research Projects Agency (DARPA)
Arlington, VA, USA
for contributions to network security systems

Sung Kim
Seoul National University
Seoul, Korea
for contributions to the design of microfabricated neural prosthetic devices

Brian E.D. Kingsbury
IBM T. J. Watson Research Center
Yorktown Heights, NY, USA
for contributions to acoustic models for automatic speech recognition

Roberta Klatzky
Carnegie Mellon University
Pittsburgh, PA, USA
for contributions to human visual, auditory, and haptic perception in robotics and virtual environments

Lang Klaus
Fraunhofer Institute for Reliability and Microintegration IZM
Berlin, Germany
for leadership in heterogeneous integration and microelectronic packaging

Xenofon Koutsoukos
Vanderbilt University
Nashville, TN, USA
for contributions to design of resilient cyber-physical systems

Michael Krames
Philips Lumileds Lighting Company
San Jose, CA, USA
for leadership in GaN-based light-emitting device physics and its commercialization

D. Richard Kuhn
US National Institute of Standards & Technology
Boulder, CO, USA
for contributions to access control and combinatorial test methods

Ajay Kumar
Hong Kong Polytechnic University
Kowloon, Hong Kong
for contributions to non-contact hand-based biometrics recognition

Isaac Lagnado
San Diego, CA, USA
for leadership in the development of silicon-on-sapphire technology

Pablo Laguna Lasosa
University of Zaragoza
Zaragoza, Spain
for contributions to cardiac biomedical signal processing

Susan Land
US Department of Defense
Madison, AL, USA
for leadership in software product development

Jungwon Lee
Samsung Semiconductor Inc.
San Diego, CA, USA
for contributions to signal processing for cellular modems

Riccardo Leonardi
University of Brescia
Brescia, Italy
for contributions to image and video compression and multimedia semantic content analysis

Hui Li
Florida State University
Tallahassee, FL, USA
for contributions to bidirectional converters for utility applications and high efficiency photovoltaic converters

Qun Li
College of William & Mary
Williamsburg, VA, USA
for contributions to ad-hoc network routing and sensor networks

Tao Li
University of Florida
Gainesville, FL, USA
for contributions to sustainable and power-efficient computer architectures

Zhuo Li
Cadence Design Systems, Inc.
Austin, TX, USA
for contributions to physical synthesis and modeling of integrated circuits

Ben Liang
University of Toronto
Toronto, ON, Canada
for contributions to mobility modeling and resource management in wireless networks

Jiao Li-cheng
Xidian University
Xian, China
for contributions to artificial neural networks and evolutionary computation

Chia-Wen Lin
National Tsing Hua University
Hsinchu, Taiwan
for contributions to multimedia coding and editing

Wei Lin
Case Western Reserve University
Cleveland, OH, USA
for contributions to nonlinear control systems

Zhouchen Lin
Peking University
Beijing, China
for contributions to low-rank data modeling and image processing

Giuseppe Lipari
University of Lille
Lille, France
for contributions to reservation-based real-time scheduling

Chee Wee Liu
National Taiwan University
Taipei, Taiwan
for contributions to high-mobility germanium and silicon-germanium MOSFETs

Jie Liu
Microsoft Research
Redmond, WA, USA
for contributions to wireless sensing

Ming Liu
Institute of Microelectronics of Chinese Academy of Sciences
Beijing, China
for contributions to the development of resistive non-volatile memories

Shengyi Liu
The Boeing Company
Seattle, WA, USA
for application of multifunctional power conversion and power source integration to aircraft

Guo-Quan Lu
Virginia Tech
Blacksburg, VA, USA
for development of materials and packaging technologies for power electronics modules

Jie Lu
University of Technology Sydney
Sydney, NSW, Australia
for contributions to fuzzy machine learning and decision support systems

Wei Lu
University of Michigan
Ann Arbor, MI, USA
for contributions to development of neuromorphic systems

Yilong Lu
Nanyang Tech University
Singapore, Singapore
for contributions to array antenna techniques in radar systems

John Luginsland
Air Force Office of Scientific Research
Arlington, VA, USA
for contributions to space-charge limited flow physics, coherent radiation sources, and computational plasma physics

Richard Lukaszewski
Rockwell Automation
Mequon, WI, USA
for contributions to the application of power electronic devices for variable frequency drives

Xiaobing Luo
Huazhong University of Science & Technology
Wuhan, China
for contributions to packaging of optoelectronic devices

Shugen Ma
Ritsumeikan University
Kusatsu-Shi, Japan
for contributions to the design and control of environment-adaptive robots

Zhenqiang Ma
University of Wisconsin-Madison
Madison, WI, USA
for contributions to flexible and biodegradable microwave electronics

Udaya Madawala
University of Auckland
Auckland, New Zealand
for contributions to power electronics for bi-directional wireless power transfer

Guoqiang Mao
University of Technology Sydney
Sydney, NSW, Australia
for contributions to localization algorithms for wireless networks

Vladimir Marik
Czech Institute of Informatics
Prague, Czech Republic
for leadership in industrial applications of cybernetics

Sonia Martinez
Univerity of California-San Diego
La Jolla, CA, USA
for contributions to the geometric mechanics and control

Saverio Mascolo
Politecnico di Bari
Bari, Italy
for contributions to modeling and control of congestion in packet networks

Andrea Massa
University of Trento
Trento, Italy
for contributions to phased arrays and electromagnetic inverse scattering

Sanu Mathew
Intel Corporation
Hillsboro, OR, USA
for leadership in computer arithmetic datapath and security circuits

Earl Mc Cune
RF Communications Consulting
Santa Clara, CA, USA
for leadership in polar modulation circuits and signals

Paul Meaney
Thayer School of Engineering at Dartmouth
Hanover, NH, USA
for contributions to microwave tomography and its translation to clinical use

Deepankar Medhi
University of Missouri-Kansas City
Kansas City, MO, USA
for contributions to optimization and the design of computer-communication networks

Russell Meier
Milwaukee School of Engineering
Milwaukee, WI, USA
for contributions to global on-line engineering education

Tommaso Melodia
Northeastern University
Boston, MA, USA
for contributions to underwater acoustic and multimedia networks

Abraham Mendelson
Technion-Israel Institute of Technology
Haifa, Israel
for contributions to power-aware architecture and value prediction for program execution

Olgica Milenkovic
University of Illinois at Urbana-Champaign
Urbana, IL, USA
for contributions to genomic data compression

Jelena Misic
Ryerson University
Toronto, ON, Canada
for contributions to modeling and performance evaluation in wireless communications

Andrea Montanari
Stanford University
Stanford, CA, USA
for applications of statistical physics to coding theory

Mehul Motani
National University of Singapore
Singapore, Singapore
for contributions to wireless communications and sensor networks

Hideki Motoyama
Central Research Institute of Electric Power Industry Corporation
Yokosuka, Japan
for contributions to lightning protection and insulation coordination of electric power systems

Saibal Mukhopadhyay
Georgia Institue of Technology
Atlanta, GA, USA
for contributions to energy-efficient and robust computing systems design

Chandra Nair
Chinese University of Hong Kong
Shatin NT, Hong Kong
for contributions to network information theory

Girish Nair
University of Melbourne
Victoria, Australia
for contributions to control and information in networked dynamical systems

Hans Peter Nee
KTH Royal Institute of Technology
Stockholm, Sweden
for contributions to silicon carbide power electronics and modular multilevel converters

Silviu-Iulian Niculescu
Centre National de la Recherche Scientifique
Paris, France
for research on the effects of delays in system dynamics

Konstantina Nikita
National Technical University of Athens
Athens, Greece
for contributions to bioelectromagnetics and implantable antennas for medical applications

Barbara Oakley
Oakland University
Rochester, MI, USA
for outreach through online engineering pedagogy

Hideo Ohno
Tohoku University
Sendai, Japan
for contributions to materials and device design for spintronics

Yew-Soon Ong
Nanyang Technological University
Singapore, Singapore
for contributions to memetic computation and applications

Hidetoshi Onodera
Kyoto University
Kyoto, Japan
for contributions to variation-aware design and analysis of integrated circuits

Javier Ortega-Garcia
Universidad Autonoma de Madrid
Madrid, Spain
for contributions to biometrics for forensic speaker verification and signature recognition

Lawrence Ozarow
Nokia- Bell Labs
New Providence, NJ, USA
for contributions to capacity characterization of fading and feedback channels

Hitay Ozbay
Bilkent University
Bilkent, Turkey
for contributions to robust control for infinite dimensional systems

Philippe Paillet
University of Montpellier-CEA
Paris, France
for contributions to the understanding of radiation effects in electronics

Patrick Panciatici
Réseau de Transport d'Électricité
Paris, France
for contributions to power systems analysis software

Stefan Parkvall
Ericsson AB
Stockholm, Sweden
for contributions to cellular standards

Jignesh Patel
University of Wisconsin
Madison, WI, USA
for contributions to high-performance spatial data analysis methods

Constantinos S. Pattichis
University of Cyprus
Nicosia, Cyprus
for contributions to medical diagnostic and mobile health systems

Shanthi Pavan
Indian Institute of Technology
Chennai, India
for contributions to delta sigma modulators and analog filters

George Pavlou
University College London
London, UK
for contributions to resource management and content-based networking

Joseph Pawlowski
Micron Technology, Inc.
Boise, ID, USA
for contributions to memory system interfaces

Peter Perkins
Tigard, OR, USA
for contributions to touch current measurement and electric shock protection

Alexei Pilipetskii
Tyco Telecommunications
Eatontown, NJ, USA
for contributions to transoceanic fiber-optic transmission systems

Josien Pluim
Eindhoven University of Technology
Eindhoven, Netherlands
for contributions to medical image analysis

Massimo Poncino
Politecnico Di Torino
Torino, Italy
for contributions to low-power circuits and systems

John Potter
Centre for Maritime Research and Experimentation (CMRE)
La Spezia, Italy
for contributions to ice-ocean interaction, oceanography, and underwater communication

Paras Prasad
State University of New York at Buffalo
Buffalo, NY, USA
for contributions in biophotonics, nanophotonics and novel biomedical technology

Konstantinos Psounis
University of Southern California
Los Angeles, CA, USA
for contributions to multi-hop wireless networks

Hairong Qi
University of Tennessee
Knoxville, TN, USA
for contributions to collaborative signal processing in sensor networks

Jianmin Qu
Tufts University
Medford, MA, USA
for contributions to design and reliability analysis for microelectronic packaging

Ronghai Qu
Huazhong University of Science & Technology
Wuhan, China
for contributions to flux modulations machines and wind generators

Tony Quek
Singapore University of Technology
Singapore, Singapore
for contributions to heterogeneous and wireless networks

CJ. Reddy
Altair Engineering Inc.
Hampton, VA, USA
for leadership in simulation methods for antenna placement and co-site analysis

Jennifer Rexford
Princeton University
Princeton, NJ, USA
for contributions to network management and associated routing systems

Brian Rigling
Wright State University
Dayton, OH, USA
for contributions to synthetic aperture radar imaging

Michael Riley
New York, NY, USA
for contributions to automatic speech recognition using Weighted Finite-State Transducers

Kim Roberts
Ciena Corporation
New York, NY, USA
for contributions to digital signal processing for coherent optical communication systems

Justin Romberg
Georgia Tech
Atlanta, GA, USA
for contributions to compressive sensing

Luca Roselli
University of Perugia
Perugia, Italy
for contributions to sustainable radio-frequency modules for wireless sensor networks

Tajana Rosing
University of California, San Diego
La Jolla, CA, USA
for contributions to power and reliability management of Systems-on-Chip

Eugeniusz Rosolowski
Wroclaw University of Technology
Wroclaw, Poland
for contributions to education in power system modeling and protection

Badrinath Roysam
University of Houston
Houston, TX, USA
for contributions to image processing algorithms for biological microscopy

Karen Rudie
Queens University
Kingston, ON, Canada
for contributions to the supervisory control theory of discrete event systems

Kazuhiro Saitou
University of Michigan
Ann Arbor, MI, USA
for contributions in computational assembly and disassembly design of mechanical products

Seiji Samukawa
Tohoku University
Sendai, Japan
for contributions to damage-free plasma processing for nano-device manufacturing

Kevin Sangston
Georgia Tech Research Institute
Atlanta, GA, USA
for contributions to coherent detection of radar signals in clutter

Venkateswara Anand Sankaran
Ford Motor Company
Dearborn, MI, USA
for leadership in power electronics and energy storage for electric vehicles

Rahul Sarpeshkar
Thayer School of Engineering at Dartmouth
Hanover, NH, USA
for contributions to ultra low-power biomedical electronics

Ronan Sauleau
Universite de Rennes
Rennes, France
for contributions to lens and millimeter wave antennas

Hiroshi Sawada
NTT Communication Science Laboratories
Nara, Japan
for contributions to blind source separation of speech and audio signals

Dieter Scherer
Palo Alto, CA, USA
for contributions to the design of oscillators and synthesized signal sources

Alex Schneider
Glen Ellyn, IL, USA
for contribution to transmission and generation failure modeling

Clint Schow
University of California Santa Barbara
Santa Barbara, CA, USA
for contributions to high bandwidth optical interconnects

Bjoern Schuller
University of Passau
Passau, Germany
for contributions to computer audition

Assaf Schuster
Technion—Israel Institute of Technology
Haifa, Israel
for contributions to cloud computing

Andrew Senior
London, UK
for contributions to pattern recognition in speech, computer vision, and biometrics

Sanjit Seshia
University of California- Berkeley
Berkeley, CA, USA
for contributions to formal methods for inductive synthesis and algorithmic verification

Shihab Shamma
University of Maryland- College Park
College Park, MD, USA
for applications of signal processing to auditory neuroscience

Dinggang Shen
University of North Carolina-Chapel Hill
Chapel Hill, NC, USA
for contributions to medical image analysis

Riichiro Shirota
National Chao-Tung University
Hsinchu, Taiwan
for contributions to the development of NAND flash memory

Jiwu Shu
Tsinghua University
Beijing, China
for contributions to dependable, high-performance storage systems architecture

Hava Siegelmann
University of Massachusetts
Amherst, MA, USA
for contributions to neural computation

Lowell Smith
Ge Global Research
Niskayuna, NY, USA
for contributions to ultrasound transducer technology for medical imaging

Gregory Snider
University of Notre Dame
Notre Dame, IN, USA
for contributions to single electron based computing technology

Yan Solihin
North Carolina State University
Raleigh, NC, USA
for contributions to shared cache hierarchies and secure processors

Min Song
Michigan Technological University
Houghton, MI, USA
for leadership in supporting wireless networking and radio spectrum access

Miguel Angel Sotelo Vazquez
Universidad de Alcala
Madrid, Spain
for contributions to intelligent vehicles for road infrastructure inspection

Siddhartha Srinivasa
Carnegie Mellon University
Pittsburgh, PA, USA
for contributions to robotic manipulation and human-robot interaction

Salvatore Stolfo
Columbia University
New York, NY, USA
for contributions to machine learning-based computer security

Peter Stone
University of Texas- Austin
Austin, TX, USA
for contributions to reinforcement learning, multiagent systems, and robotics

David Stork
Rambus
Sunnyvale, CA, USA
for contributions to pattern recognition and image analysis

Weifeng Su
State University of New York at Buffalo
Buffalo, NY, USA
for contributions to multi-input multi-output wireless communications and cooperative networks

Rahul Sukthankar
Google, Inc.
Mountain View, CA, USA
for contributions to video understanding

Hong-Bo Sun
Jilin University
Jilin, China
for contributions to laser nanofabrication and ultrafast spectroscopy

Hongbin Sun
Tsinghua University
Beijing, China
for contributions to algorithms and technologies for energy management systems

Shuji Tanaka
Tohoku University
Sendai, Japan
for contributions to micro-electromechanical systems for acoustic wave devices, physical sensors, and power generation

Mark Tehranipoor
University of Florida
Gainesville, FL, USA
for contributions to integrated circuits security and trust

Juergen Teich
University of Erlangen-Nuremberg
Erlangen, Germany
for contributions to hardware/software co-design for embedded systems

Marina Thottan
Nokia- Bell Labs
New Providence, NJ, USA
for leadership in high-speed internet-protocol networks

Yingli Tian
City College of NY-SUNY
New York, NY, USA
for contributions to automatic facial expression analysis and human activity understanding

Jocelyne Troccaz
TIMC-IMAG Laboratory
La Tronche Cedex, France
for contributions to robotics and imaging for medical applications

John Tsotsos
York University
Toronto, ON, Canada
for contributions to active vision and computational models of visual attention

Marcelo Valdes
GE Industrial Solutions
Cary, NC, USA
for contributions to improving the safety and reliability of low voltage power systems

Matthew Valenti
West Virginia University
Morgantown, WV, USA
for contributions to cooperative diversity and development of distributed turbo codes

Victor Veliadis
PowerAmerica
Raleigh, NC, USA
for contributions to development of silicon carbide power devices

Giovanni Vigna
University of California- Santa Barbara
Santa Barbara, CA, USA
for contributions to Internet security and cybercrime prevention

Sergiy Vorobyov
Aalto University
Espoo, Finland
for contributions to optimization in robust signal processing

Haixun Wang
Google Research
Palo Alto, CA, USA
for contributions to knowledge bases for text understanding

Li-C Wang
University of California- Santa Barbara
Santa Barbara, CA, USA
for contributions to statistical timing analysis for integrated circuits

Peng Wang
Nanyang Technological University
Singapore, Singapore
for contributions to power system reliability and hybrid AC/DC micro-grids

Xudong Wang
Shanghai Jiao Tong University
Shanghai, China
for contributions to wireless mesh networks

Yu Wang
University of North Carolina- Charlotte
Charlotte, NC, USA
for contributions to topology design and performance optimization in wireless networks

Robert Weikle
University of Virginia-Charlottesville
Charlottesville, VA, USA
for contributions to millimeter-wave and submillimeter-wave electronics and instrumentation for terahertz frequencies

Daniel Weile
University of Delaware
Newark, DE, USA
for contributions to computational electromagnetics

Mark Weiss
Florida International University
Miami, FL, USA
for advancements in computer science education

Stephen Welby
IEEE
Piscataway, NJ, USA
for leadership in defense and aerospace systems engineering

Thomas Weller
University of South Florida
Tampa, FL, USA
for contributions to modeling and design of passive microwave circuits and components

Qihao Weng
Indiana State University
Terre Haute, IN, USA
for contributions to urban remote sensing

David Whelan
University of California, San Diego
La Jolla, CA, USA
for leadership in space-based navigation, synchronization, and surveillance

Jean-Pierre Wigneron
Université de Bordeaux
Villenave d'Ornon, France
for contributions to surface modeling in passive microwave remote sensing

James Wilkinson
University of Southampton
Southampton, UK
for contributions to integrated photonics

Laurie Williams
North Carolina State University
Raleigh, NC, USA
for contributions to reliable and secure software engineering

Stefan Winkler
Singapore, Singapore
for contributions to perceptual video quality measurement

Philip Winston
Southern Company
Atlanta, GA, USA
for development of standards in power system protection reliability

Stephen T. Wong
Houston Methodist Hospital
Houston, TX, USA
for leadership in drug discovery, systems biology, bioinformatics, and health analytics

Rebecca Wright
Rutgers, The State University of New Jersey
Piscataway, NJ, USA
for contributions to applied cryptography and privacy

Shien-Yang Wu
Taiwan Semiconductor Manufacturing Company, Limited
Hsinchu, Taiwan
for leadership in CMOS process integration

Huikai Xie
University of Florida
Gainesville, FL, USA
for contributions to micro-electromechanical optical scanning systems

Tao Xie
University of Illinois at Urbana–Champaign
Urbana, IL, USA
for contributions to software testing and analytics

Hao Xin
University of Arizona
Tucson, AZ, USA
for contributions to electromagnetic metamaterials and 3D printing of metamaterial structures

Dong Xu
University of Sydney
Sydney, NSW, Australia
for contributions to recognition and retrieval of multimedia and biometric data

Jianbin Xu
Chinese University of Hong Kong
Shatin NT, Hong Kong
for contributions to nanoscale electronic materials and devices

Yang Yang
Shanghai Institute of Microsystem and Information Technology (SIMIT)
Shanghai, China
for contributions and leadership in wireless access and networking

Anthony Yen
ASML
San Jose, CA, USA
for leadership in extreme-ultraviolet lithography for high volume manufacture of integrated circuits

Dong Yu
Bothell, WA, USA
for contributions to context-dependent automatic speech recognition

Richard Yu
Carleton University
Ottawa, ON, Canada
for contributions to mobility management and radio resource allocation in mobile wireless networks

Habib Zaidi
Geneva University Hospital
Geneva, Switzerland
for contributions to quantitative multimodality molecular imaging

Changshui Zhang
Tshinghua University
Beijing, China
for contributions to semi-supervised learning for signal processing

Lei Zhang
Hong Kong Polytechnic University
Hong Kong, China
for contributions to sparsity-based image modeling and perceptual image quality assessment

Yanyong Zhang
Rutgers, The State University of New Jersey
New Brunswick, NJ, USA
for contributions to robust and efficient large-scale sensor networks

Zhensheng Zhang
Livermore, CA, USA
for contributions to wireless ad-hoc and optical networks

Zhengming Zhao
Tsinghua University
Beijing, China
for contributions to electromagnetic transient analysis and control of high-voltage high-power electronics conversion

Tong Zhou
Tsinghua University
Beijing, China
for contributions to robust identification and estimation of control systems

Xiaofang Zhou
University Of Queensland
Queensland, Australia
for advancements in database query processing

Peiying Zhu
Huawei Technologies Canada
Ottawa, ON, Canada
for leadership in wireless communications systems

Thomas Zwick
Karlsruhe Institute of Technology
Karlsruhe, Germany
for contributions to millimeter wave transceivers

2018 IEEE FELLOW COMMITTEE ROSTER

Stefano Galli (Chair)
Tariq Samad (Vice Chair)
David Allstot (Life Fellow)
Nirwan Ansari
David Bader
Supriyo Bandyopadhyay
Piero Bonissone (Life Fellow)
Gerard Capolino
Babu Chalamala
Kent Choquette
Djalma Falcao (Life Fellow)
Bijoy Ghosh
Jay Giri (Life Fellow)
Maria Greco
Abdelsalam Sumi Helal
Hideto Hidaka
Sari Hikmet
Joseph Hughes
Hamid Jafarkhani
Pooi-Yuen Kam
Mark Karol
Ashfaq Khokhar
James Knighten (Life Fellow)
Sy-Yen Kuo
Hideo Kuwahara (Life Fellow)
Jae Hong Lee
Wei-Jen Lee
Yong Lian (Peter)
Leda Lunardi
Vahid Madani
Diana Marculescu
Subhasish Mitra
John Norgard (Life Fellow)
Dalma Novak
Douglas O'Shaughnessy
Erdal Panayirci (Life Fellow)
Nalini Ratha
Tapan Sarkar (Life Fellow)
Donatella Sciuto
Gianluca Setti
Joseph E. Silva
Morris Sloman
Akihiko Sugiyama
Joos Vandewalle (Life Fellow)
Bo Wahlberg
Albert Wang
Peter Willett
Gary Yen
Aylin Yener
Daniel Yeung
Junku Yuh
Yuan-Fang Zheng (Life Fellow)

REALIZE THE FULL POTENTIAL OF IEEE

IEEE Foundation

With roots dating back to 1884, IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humankind. The size of IEEE, scale and access to decision-makers in government, academia and industry enables it to play a unique and important role in driving innovation, work-force development and global problem solving through the application of engineering.

Thanks to donor support, the IEEE Foundation strives to be a leader in transforming lives through the power of technology and education.

The IEEE Foundation, established in 1973, is the philanthropic partner of IEEE. Our work inspires the generosity of donors to enable IEEE programs that improve access to technology, enhance technological literacy, and support technical education and the IEEE professional community.

IEEE Foundation:

Inspires Donations to IEEE
Bringing visibility, focus, scale, impact and relevance to the work of IEEE through philanthropy

Manages Donations for IEEE
Ensuring effective financial management and strong governance

Invests in Programs of IEEE
Turning the donations into action and impact through IEEE Programs

IEEE Foundation is leading a special campaign across IEEE's expansive network to raise awareness, forge partnerships and generate the required financial resources to fund these Priority Initiatives:

IEEE Smart Village: Expanding access to sustainable electricity, education and entrepreneurial solutions to empower off grid communities.

EPICS in IEEE: Enabling students to envision, develop and install technology solutions that solve community problems. *(Engineering Projects in Community Service)*

PES S+: Awarding transformational scholarships and connecting unique career experiences. *(Power & Energy Society Scholarship Plus Initiative)*

REACH: Bringing the importance of engineering and technology to a wider audience in more dynamic ways. *(Raising Engineering Awareness through the Conduit of History)*

Additionally, expanding the IEEE Awards Program, supporting IEEE History Center programs and leveraging the strong IEEE–Eta Kappa Nu connection are important components of this special campaign.

IEEE Foundation

445 Hoes Lane | Piscataway, NJ 08854, USA | donate@ieee.org | 732.562.5446 | www.ieeefoundation.org

2018 IEEE Board of Directors

IEEE President and CEO ..... James A. Jefferies
IEEE President-Elect ..... José M.F. Moura
IEEE Past President ..... Karen Bartleson
Director & Secretary ..... William P. Walsh
Director & Treasurer ..... Joseph V. Lillie
Director & Vice President, Educational Activities ..... Witold M. Kinsner
Director & Vice President, Publication Services and Products ..... Samir M. El-Ghazaly
Director & Vice President, Member and Geographic Activities ..... Martin Bastiaans
Director & President, Standards Association ..... Forrest D. "Don" Wright
Director & Vice President, Technical Activities ..... Susan "Kathy" Land
Director & President IEEE-USA ..... Sandra "Candy" Robinson
Director & Delegate, Region 1 ..... Babak Beheshti
Director & Delegate, Region 2 ..... Katherine J. Duncan
Director & Delegate, Region 3 ..... Gregg L. Vaughn
Director & Delegate, Region 4 ..... Bernard T. Sander
Director & Delegate, Region 5 ..... Robert C. Shapiro
Director & Delegate, Region 6 ..... Kathleen Kramer
Director & Delegate, Region 7 ..... Maike Luiken
Director & Delegate, Region 8 ..... Margaretha A. Eriksson
Director & Delegate, Region 9 ..... Teofilo Ramos
Director & Delegate, Region 10 ..... Kukjin Chun
Director & Delegate, Division I ..... Renuka P. Jindal
Director & Delegate, Division II ..... F.D. "Don" Tan
Director & Delegate, Division III ..... Vijay K. Bhargava
Director & Delegate, Division IV ..... Jennifer T. Bernhard
Director & Delegate, Division V ..... John W. Walz
Director & Delegate, Division VI ..... John Y. Hung
Director & Delegate, Division VII ..... Bruno Meyer
Director & Delegate, Division VIII ..... Dejan Milojicic
Director & Delegate, Division IX ..... Alejandro "Alex" Acero
Director & Delegate, Division X ..... Toshio Fukuda
Director Emeritus ..... Theodore W. Hissey

2018 IEEE Awards Board Committee

Chair, Mark J. Karol
Past Chair, Kensall (Ken) D. Wise
Vice Chair & APPRC Chair, Richard V. Cox
Member-at-Large, Amir Aghdam
Member-at-Large, Hanna Bogucka
Member-at-Large, Nim K. Cheung
Member-at-Large, Celia Desmond
Division Director, Dejan Milojicic
Region Director & IEEE BoD Coordinator, Bernard T. Sander
Medals Council Chair, Muriel Medard
Recognitions Council Chair, Adam Drobot
Technical Field Awards Council Chair, Vincenzo Piuri
AB Presentation and Publicity Chair, Leslie Martinich
AB Finance Committee Chair, Robert L. Anderson
AB Joint Awards with National Societies Standing Committee Chair, Francisco Martinez
EAB/ARC Chair, Tariq Durrani
MGA/ARC Chair, Takatoshi Minami
SA/ARC Chair, Ronald C. Peterson
TAB/ARC Chair, John O'Reilly
USA/ARC Chair, John D. Johnson

Editor
Leslie Russell

Sr. Editor
Lynn Frassetti

Assistant Editor
April Compertore

Copy Editor
Brian Benbrook

Director and Periodical Production Services
Peter Tuohy

Supervisor and Periodical Production Services
Louis Vacca

Senior Art Director
Janet Dudar

Art and Production
Gail Schnitzer, Theresa Smith

Sponsorship & Fundraising
Keyana Tennant

Award Selection Cmte. Support
Kerry Ann Ward
Mahjeda Ali

Advisory Board

Marybeth Denike
Director, IEEE Awards Activities

Donna Hourican
IEEE Staff Executive—Corporate Activities

Mark J. Karol
Awards Board Chair

Liz McCarthy
Executive Communications Manager

Awards Presentation and Publicity Committee
Leslie Martinich (Chair), Irena Atov, Michael R. Andrews, Margaretha Eriksson, Mario Milicevic

IEEE Operations Center
445 Hoes Lane
Piscataway, NJ 08854-4141 USA
Telephone: +1 732 562 6588
www.ieee.org/awards
Follow us at: twitter.com/IEEEAwards
Like us at: www.facebook.com/IEEEAwards
Follow us at: Linkedin.com/company/ieee-awards

The 2018 Awards Booklet is printed on 100% paper fibers from sustainable forestry.

IEEE prohibits discrimination, harassment and bullying. For more information, visit http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html

INNOVATION EXCELLENCE INGENUITY ENGINEERING

WWW.IEEE.ORG/AWARDS 3 PARK AVENUE 17TH FLOOR NEW YORK, NY 10016