2017 IEEE AWARDS

IEEE
Advancing Technology for Humanity

Dear IEEE Members, Honorees, Colleagues, and Guests:

Welcome to the 2017 IEEE VIC Summit and Honors Ceremony Gala!

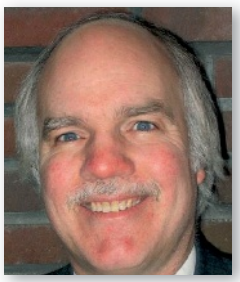
The inaugural IEEE Vision, Innovation, and Challenges Summit presents a unique opportunity to meet, mingle, and network with peers and some of the top technology "giants" in the world. We have created a dynamic one-day event to showcase the breadth of engineering by bringing innovators, visionaries, and leaders of technology to the Silicon Valley area to discuss what is imminent, to explore what is possible, and to discover what these emerging areas mean for tomorrow. The day sessions will look to the future of the industry and the impact engineers will have on serving the global community. The Summit's activities culminate with this evening's IEEE Honors Ceremony Gala.

Tonight's awards ceremony truly reflects the universal nature of IEEE, as the visionaries and innovators we celebrate herald from around the world. We are proud of the collective technical prowess of our members and appreciate the rich diversity of the engineering, scientific, and technical branches in which our colleagues excel. At IEEE, we are focused on what is next—enabling innovation and the creation of new technologies. IEEE, as a global community, has for decades seen the challenges facing our world. Time and time again, IEEE members have risen to face those challenges and have leveraged the power of technology to improve the human condition. Technology can overcome tough challenges. It always has. And at no other point in history have we had such opportunities for technical innovation available to us, ready to shape our world.

The IEEE Honors Ceremony is a celebration of those visionaries, leaders, and legends—our members and colleagues who continue to define technology's state of the art. And it is our hope that the IEEE VIC Summit will become IEEE's most external-facing annual event, looking to the future of the industry and sharing the impact engineers have on serving the global community. This year we are also excited to celebrate a milepost in IEEE history: It is the 100th anniversary of the IEEE Medal of Honor, IEEE's highest award. Established in 1917, its recipients include Guglielmo Marconi, Claude E. Shannon, William Shockley, Robert M. Metcalfe, and Gordon E. Moore—and we are so pleased that Kees Schouhamer Immink will be given the Medal of Honor this evening.

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 speakers, panelists, and well-qualified award nominees—the diverse array of educators, engineers, scientists, innovators, visionaries, leaders, entrepreneurs, and practitioners—who exemplify the mission of the IEEE of advancing technology for the benefit of humanity.

Karen Bartleson,
IEEE President and CEO



Mark J. Karol,
IEEE Awards Board Chair

9:30 AM **Welcome Remarks**
Welcome from IEEE President Karen Bartleson
Introductions by "Masters of Ceremonies" for the day, Futurists Brian David Johnson (ASU) and Monique Morrow (Chief Technology Strategist)

9:45 AM **Keynote: Engineering the 21st Century:** James D. Plummer, Professor, and Former Dean of Engineering, Stanford University

10:30 AM **Energy & Powering the Planet:** Wanda Reder, Chief Strategy Officer, S&C Electric Company

11:00 AM *Break*

11:15 AM **Healthcare Innovations – Vision into the Future:** Sarah Audet, Program Director, Medtronic

11:45 AM **Pioneering the Autonomous Driving Space:** Alberto Broggi, General Manager at VisLab srl

12:15 PM **Luncheon & Networking** *(Ralston Room)*
Mixer with panelists, speakers, recipients, and attendees

1:30 PM **Panel Discussion on Entrepreneurship: Innovating & Challenges:**
Moderated by Mario Milicevic, Past Chair, IEEE Young Professionals;
Kurt Petersen, Band of Angels; Samantha Snabes, Co-Founder of re:3D;
Craig Barratt, CEO of Barefoot Networks; Ana Baltodano, Founder & CEO, Visualyst

3:00 PM *Break*

3:15 PM **The Evolution of Secure Things:** Alex Gantman, Vice President of Engineering for Qualcomm Technologies, Inc.

3:45 PM **Impact on Society: Systems Engineer to Systems Entrepreneur for Global Change:**
Erna Grasz, Co-Founder Asante Africa Foundation

4:15 PM **A Century of Innovation:** Thomas Lee, Professor, Electrical Engineering, Stanford University

4:45 PM *Closing Remarks*

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

5:30 PM **Honors Ceremony Gala and Dinner** *(Grand Ballroom)*

SPEAKERS

The future is **Brian David Johnson's** business. As a futurist he works with organizations to develop an actionable 10- to 15-year vision and what it will feel like to live in the future. His work is called futurecasting, using ethnographic field studies, technology research, cultural history, trend data, global interviews, and even science fiction to provide a pragmatic road map of the future. As an applied futurist Johnson has worked with governments, trade organizations, start-ups, and multinational corporations to not only help envision their future but specify the steps needed to get there. Johnson is currently the futurist in residence at Arizona State University's Center for Science and the Imagination and a professor in the School for the Future of Innovation in Society. He is also a futurist and fellow at Frost and Sullivan.

Johnson appears regularly on Bloomberg TV, PBS, Fox News, and the Discovery Channel and has been featured in major magazines.

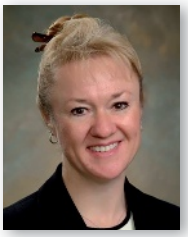
Monique Morrow is a chief technology strategist. Focused on the intersection between economics, technology, and research, she is defining mechanisms and marketplace scenarios for cloud federation constructs to include security. She was previously Cisco's chief technology officer of services, where she was responsible for aligning the Cisco Services Technology vision and architectures with the business strategy. Morrow has been recognized as *Business Worldwide Magazine's* 2016 Visionary of the Year for Technology, Social Change and Ethics, and she was named one of the Top Ten Influential IT Women in Europe. She is also co-WISE Exec Sponsor at Cisco and an advocate for the Cisco Women in Technology and Cisco Women for Cybersecurity communities. She is published in IEEE and other journals, she speaks frequently at conferences, and she co-authored three books. Her specialties include networking technology, grid cloud computing, E-health, and business development.

James D. Plummer supported and lead major innovations at Stanford University's School of Engineering that have changed the way engineering research and teaching is carried out, impacting industry and academia worldwide. As the longest-serving dean (1999-2014), he led the efforts at Stanford to build major interdisciplinary centers to address challenges facing engineering such as energy, the environment, and biomedicine. He also helped develop online education courses and technologies and the world's first massively open online courses (MOOCs) to provide unlimited participation and open access to learning through the Internet. Plummer's contributions to the school have been instrumental in increasing the number of students choosing engineering majors, especially in computer science, product design, and bioengineering. An IEEE Fellow and member of the U.S. National Academy of Engineering, Plummer holds the John Fluke Professorship in Electrical Engineering at Stanford University, Stanford, CA, USA.

Sarah Audet has worked in the area of sensor and medical device, design, development, and manufacture at several companies including AT&T, Princeton Gamma-Tech, Motorola, and Medtronic. She is currently a program director at Medtronic, where she has worked since 1997. She is also on the Board of Directors of Starbase Minnesota, a 501c nonprofit whose mission is to educate and inspire youth in science, technology, engineering, and math, and to mentor women in science fields.

She received her B.S. degree from the State University of New York at Upstate Medical Center in the area of medical technology, M.S. in electrical engineering from Boston University, and her Ph.D. in electrical engineering from the Technical University of Delft, the Netherlands. Sarah has also earned an M.B.A., project management professional certification, and Six Sigma Black Belt certification.

Mario Milicevic is a Ph.D. candidate in the Department of Electrical and Computer Engineering at the University of Toronto, where his research focuses on the integrated circuit design of error-correction decoders for wireless, optical, and quantum security systems. He served as the 2015-2016 chair of the global IEEE Young Professionals committee where he was involved in launching IEEE's technology entrepreneurship community and bringing exposure to the IEEE Young Professionals at high-profile global events such as the Consumer Electronics Show, South by Southwest Conference, and the Web Summit.



Wanda Reder is the chief strategy officer at S&C Electric Company, a global provider of electric power switching, protection, and control solutions. She has responsibility for strategy, competitive positioning, and acquisitions, and she built an engineer-procure-construct organization that has positioned S&C as a leader in wind, solar, and energy storage markets. Prior to S&C, she served as vice president at Exelon, overseeing asset management, engineering, planning, and standards for electric utility power operations in Philadelphia, PA, and Chicago, IL.

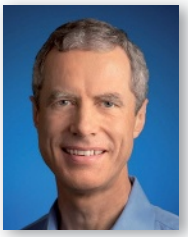
Ms. Reder has also been a long-time IEEE volunteer. She served as the first woman president of the IEEE Power & Energy Society. During her tenure, she created trendsetting programs such as the launch of "IEEE Smart Grid," which carved a leadership position for IEEE. It has become the definitive source for information on smart grid technology using social media and Web presence.

Alberto Broggi is general manager at VisLab srl (spinoff of the University of Parma, acquired by Silicon-Valley company Ambarella Inc. in June 2015) and a professor of computer engineering at the University of Parma, Italy, and has been pioneering the field of machine vision applied to driverless cars and unmanned vehicles in general.

Broggi has organized milestone events in the development of vehicular robotics including the 1998 MilleMiglia in Automatico, the TerraMax 14-ton driverless truck, the 2010 VisLab Intercontinental Autonomous Challenge, and the 2013 BRAiVE project, which involved an autonomous vehicle negotiating two-way narrow rural roads, pedestrian crossings, traffic lights, and roundabouts in the middle of the day in downtown Parma without human intervention and representing the first time an autonomous vehicle was driven on public roads with no one in the driver's seat for part of the test.

Kurt Petersen received his B.S. with honors in electrical engineering from the University of California, Berkeley, in 1970, and a Ph.D. in electrical engineering from the Massachusetts Institute of Technology in 1975. Since 1982, he has cofounded six successful, high-tech companies in Silicon Valley, including Cepheid. In 2001, he was awarded the IEEE Simon Ramo Medal for his contributions to micro-electromechanical systems (MEMS). Petersen is a member of the U.S. National Academy of Engineering and is a Life Fellow of the IEEE in recognition of his contributions to "the commercialization of MEMS technology." In 2011, Petersen joined the Silicon Valley Band of Angels. Today, he spends most of his time helping and mentoring early stage, high-tech start-up companies.

Samantha Snabes is a catalyst for re:3D facilitating connections between others printing huge and/or using recycled materials to create more access to three-dimensional printable solutions worldwide. Previously, she served as the Social Entrepreneur in Residence for the NASA Headquarters and deputy strategist supporting NASA Johnson Space Center's Space Life Sciences Directorate after selling a start-up for a U.S. Defense Advanced Research Projects Agency-funded, co-patented tissue culture device. She holds a B.S. in biology, B.A. degrees in international relations and hispanic studies, an M.B.A. with concentrations in supply chain management and international relations, and certifications as a firefighter and emergency medical technician - basic.

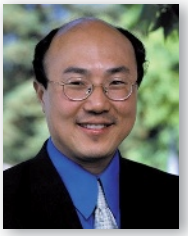


Craig Barratt is an industry leader in wireless technology and communications. From 2013 to 2017, he was a senior vice president at Google and chief executive officer of Alphabet's Access division, which includes the Google Fiber, gigabit-speed Internet service. Prior to Google, he was president and chief executive officer of Atheros, one of the semiconductor pioneers of WiFi, where he led its public offering in 2004 and sale to Qualcomm in 2011. Barratt holds Ph.D. and a master in electrical engineering from Stanford University, and B.Eng. and B.Sc. degrees from the University of Sydney. He is the coauthor of a book on linear controller design and a co-inventor of 34 U.S. patents and several open source projects. Craig Barratt currently serves as CEO of Barefoot Networks.

Ana Baltodano is currently the founder and chief executive officer of Visualyst. She is experienced in helping portfolio entrepreneurs accelerate growth, provides advice on strategy, and prepares them for fundraising. She has also provided direction and management to several international and Silicon Valley venture-backed growth-stage companies. Ana cofounded and was chief executive officer of LocalHero, a social location-based assistance application that launched at TechCrunch Disrupt in 2011. In 2008, she cofounded TripJane, the first social-travel application to be fully integrated into Facebook. Prior to TripJane, she was a founding team member of RedHerring, a leading global technology media company that published a monthly print publication covering innovation news from around the globe and produced a host of tech conferences designed to bring venture capitalists, entrepreneurs, and technologists together.

Alex Gantman joined Qualcomm in 1996 as a software engineer and in 2001 transitioned to a product security role after receiving his master's degree specializing in cryptography and network security. Gantman now serves as vice president of engineering for Qualcomm Technologies, Inc. He is responsible for leading the Qualcomm Product Security Initiative (QPSI) and was one of the founding members of QPSI in 2006. In his current role, he oversees product security support across all business units and market segments, including Mobile Computing, Networking, Automotive, Healthcare, Smart Home, Wearables, and Internet of Things. He most recently held the position of senior director, product security. His technical expertise spans a wide domain of computer security, from silicon-level hardware security to Web application and protocol security. He holds numerous patents in the field of computer security.

Erna Grasz cofounded Asante Africa Foundation with two visionary African women from Kenya and Tanzania. She refers to herself as a systems engineer turned systems entrepreneur for global impact. Originally trained as an electrical-system engineer, she spent her early career at Lawrence Livermore National Laboratory and then in Silicon Valley. While spending 25 years in the corporate world as a senior executive, she earned the reputation as a strategic leader and "organizer of chaos," with demonstrated success in diverse industries, including medical device, defense research, and semiconductor capital equipment. In 2011 she left the corporate world to manage Asante Africa Foundation full time. She brings her business savviness to the nonprofit world and is the visionary behind many of the organization's innovative programs and practices. She has a strong belief in local staff, local partnerships, and developing local talent for long-term sustainability.



Thomas Lee, IEEE Member and Packard Foundation Fellow, has been at Stanford University since 1994, having previously worked at Analog Devices, Rambus, and other companies. He's helped design PLLs for several microprocessors (notably AMD's K6-K7-K8 and DEC's StrongARM) and has founded or cofounded several companies, including the first three-dimensional memory company, Matrix Semiconductor (acquired by Sandisk), and IoE companies ZeroG Wireless (acquired by Microchip) and Ayla Networks. Lee is a member of the board of Xilinx, served as director of the U.S. Defense Advanced Research Projects Agency's Microsystems Technology Office (for which he was awarded the U.S. Secretary of Defense Medal for Exceptional Civilian Service), holds ~70 patents, and has written several textbooks. He owns about 200 oscilloscopes, thousands of vacuum tubes, and kilograms of obsolete semiconductors. No one, including himself, quite knows why.

Thursday, 25 May 2017
The Palace Hotel
San Francisco, California, USA

OPENING REMARKS—IEEE President and CEO, Karen Bartleson & IEEE President-Elect, James A. Jefferies

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IEEE Spectrum Technology in the Service of Society Award ..... Indian Institute of Technology, Madras
IEEE Spectrum Emerging Technology Award ..... SpaceX
IEEE Corporate Innovation Award ..... Analog Devices, Inc.
IEEE Richard M. Emberson Award ..... David A. Hodges
IEEE Haraden Pratt Award ..... John T. Barr, IV
IEEE Honorary Membership ..... Sir James Dyson
IEEE Alexander Graham Bell Medal ..... H. Vincent Poor
IEEE Simon Ramo Medal ..... John S. Baras
IEEE James H. Mulligan, Jr. Education Medal ..... Stephen P. Boyd
IEEE Founders Medal ..... Takeo Kanade
IEEE Medal for Innovations in Healthcare Technology ..... Yulun Wang
IEEE Richard W. Hamming Medal ..... Shlomo Shamai
IEEE Jack S. Kilby Signal Processing Medal ..... Martin Vetterli
IEEE Jun-ichi Nishizawa Medal ..... Ching W. Tang, Stephen R. Forrest, Mark E. Thompson
IEEE Robert N. Noyce Medal ..... Henry I. Smith
IEEE Dennis J. Picard Medal for Radar Technologies and Applications ..... Hugh Griffiths
IEEE Medal in Power Engineering ..... Marian P. Kazmierkowski
IEEE John von Neumann Medal ..... Vladimir Vapnik
IEEE Medal for Environmental and Safety Technologies ..... Alberto Broggi
IEEE Edison Medal ..... M. George Craford
IEEE Medal of Honor ..... Kees Schouhamer Immink

IEEE MEDALS, AWARDS, AND RECOGNITIONS

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

Also Featured in the Booklet

2017 MEDALS AND RECOGNITION SPONSORS

The awards presented by the 2017 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

Indian Institute of Technology (IIT) Madras

The Indian Institute of Technology Madras (IIT-M), in conjunction with industrial partners, relies on solar-powered direct current (DC) micro grids. For homes not connected to the grid, a 125-watt micro grid can serve as the sole source of electricity. For connected households, the micro grid acts as a backup power supply to let lighting and essential appliances continue operating even during brownouts. In 2014, IIT began field-testing the DC micro grid systems in dozens of buildings at IIT-M. The micro grid will enable homes to be fitted with energy-efficient DC devices like LED bulbs, television, cellphone chargers, and brushless DC motor-based fans, designed by IIT-M. In India, micro grids are expected to evolve rapidly. With thousands of Indian villages still un-electrified, the decentralized micro grids are a viable solution to power them. A low-maintenance micro grid has the potential to eliminate dependence on expensive diesel fuel and the grid. The deployments have started expanding to about a thousand homes in three cities and multiple villages. Now, with funding from India's Ministry of Power, ITT has two large-scale projects under way that will eventually reach more than 100,000 households.

IEEE Spectrum Emerging Technology Award

Sponsored by IEEE Spectrum

SpaceX

Space Exploration Technologies (SpaceX) has achieved a milestone in space flight by creating and demonstrating a suite of technologies capable of returning a rocket-booster safely to Earth. These technologies promise to reduce the cost of getting to Earth's orbit by enabling the rapid reuse of space launch vehicles. The technology has been used to recover the first stages of SpaceX's Falcon rockets, which have been launching supplies to the International Space Station under a contract with NASA since 2012. The company achieved a major milestone on 8 April 2016, when a Falcon 9 rocket was launched at Cape Canaveral in Florida to bring cargo to the space station. A few minutes after the launch the first-stage burned out. Then, nine minutes after liftoff, the empty booster landed itself vertically on a drone ship 300 km from the Florida coastline. That achievement was followed by another milestone on 30 March of this year, when the company relaunched that very same Falcon 9 booster and then landed it on a barge off the Florida coast. Technological breakthroughs that enabled the Falcon 9 booster to land safely included control systems, rocket-ignition, and thermal protection. The project's long-term objectives include returning not only the first but also the second stages of a launch vehicle and enabling the reuse of an entire rocket within 24 hours of the first launch.

IEEE Corporate Innovation Award

Sponsored by IEEE

Analog Devices, Inc.

For sustained innovation and leadership in the development of high-performance data converter technology and products

The converter products developed by Analog Devices, Inc. (ADI) are intelligently bridging the gap between the analog and digital worlds to help the digital revolution reach new markets and applications. Having introduced over 3,000 innovative converter products since 1965, ADI continues to push the state of the art in performance, allowing a wide variety of systems to connect the emerging world of digital processing to real-world analog signal processing. ADI's products enable the acquisition of analog data; conversion of that data into digital format for computation, manipulation, storage, and transmission; and the return of the data back to the real world as analog control, display, or sound. ADI introduced the first generations of "complete" converters, providing high performance and ease of use. The ability to integrate more functionality with precision converters—such as programmable gain amplifiers, multiplexers, self-calibration, and digital isolation—has greatly enhanced key industrial applications such as smart sensors, field instruments, programmable logic controllers, and distributed control systems. ADI's contributions to modern delta-sigma measurement converters revolutionized high-precision applications such as weigh scales, strain gauges, and temperature measurements that have led to lower production costs and more environmentally friendly factories. ADI's advances in delta-sigma converters have also driven the revolution in portable audio devices by enabling wide dynamic range at very low power levels, and on-chip analog and digital filtering has enabled radios that are many times smaller and lower in power than previous generations. ADI's ability to add precision analog circuits to standard complementary metal-oxide semiconductor (CMOS) digital circuits has led to the introduction of microconverters that combine precision amplifiers, voltage references, and temperature sensors with industry-standard microprocessor cores to improve automotive battery life and the accuracy of healthcare vital-sign monitoring devices.

With headquarters located in Norwood, MA, USA, Analog Devices, Inc. is led by Vincent Roche, president and chief executive officer. Ray Stata is cofounder of the company and chairman of the board.

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

David A. Hodges

For effective leadership in advancing IEEE's goals for excellence in publications, conferences, and awards

A dedicated IEEE volunteer leader, David A. Hodges has never shied away from making difficult proposals and decisions in trying to do what's best for IEEE and its members. As chair of the IEEE Publication Services and Products Board's (PSPB) Joint Products/Services Committee, Hodges was instrumental in changing the formula for distributing income among IEEE Societies to reflect the value of electronic access. With the launch of IEEE's Electronic Library for disseminating publications, Hodges had the vision to realize that basing revenue on the number of times articles were accessed was a fairer method than using page counts of printed publications. He patiently guided the institutional changes needed to make the new formula a reality. Also while chair of the PSPB, Hodges led the creation of an open-access journal called *IEEE Access*. Launched in 2013, *IEEE Access* provides a venue for articles that may not fit the tightly focused scopes of other IEEE publications. Gaining support for the project proved difficult, based on concerns that its broad scope would cannibalize existing IEEE publications. Hodges addressed these concerns over many meetings to eventually convince the IEEE Technical Activities Board (TAB) to approve the launch of the publication. As vice president of the PSPB, Hodges' visionary leadership helped persuade the IEEE Board of Directors and TAB to adopt the PSPB's interactive content project to make IEEE articles accessible on any mobile or desktop device. The 6-year, US$35-million effort is considered essential to IEEE's competiveness in science and technology publishing. Hodges also helped streamline the IEEE Awards program as chair of the IEEE Awards Board, retiring awards with few nominees and spurring the creation of new awards representing evolving disciplines.

An IEEE Life Fellow and recipient of the 1997 IEEE Education Medal (now the James H. Mulligan, Jr. Education Medal), Hodges is the Daniel M. Tellep Distinguished Professor Emeritus at the University of California, Berkeley, Berkeley, CA, USA.

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

IEEE Haraden Pratt Award

Sponsored by the IEEE Foundation

John T. Barr, IV

For sustained leadership and service across IEEE and Society levels

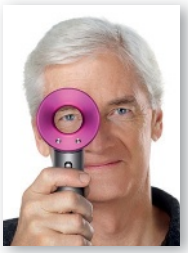
With volunteer service spanning the Society level to the IEEE Board of Directors, John T. Barr, IV has been instrumental in effecting change to make IEEE a better organization. Known for his honesty and transparency and putting the facts of a situation above anyone's ownership of an idea, Barr's leadership style has proven invaluable in helping IEEE achieve its goals. As the IEEE Technical Activities Board (TAB) Periodicals Packages Committee (2002–2004) chair, Barr led creation of a performance-based algorithm to fairly distribute IEEE Electronic Library (IEL) revenue to Societies based on online readership of articles, replacing an outdated formula and emphasizing the role that electronic delivery would play in the technical publishing. As Finance chair of the IEEE Publications Products and Services Board (PSPB) (2005–2008), Barr created a product development funding mechanism for platform enhancements of IEEE *Xplore* (IEEE's largest revenue source) by budgeting annually a portion of IEEE's electronic publishing revenue. This guaranteed development budget helped transform *Xplore* into the leading database for technical engineering information and helped protect IEL revenue. As IEEE TAB Treasurer (2009–2012), Barr led the development of the first formal IEEE Reserves Policy to set an appropriate level of reserves needed to ensure that IEEE can survive considering unknown risks while still using its resources to support its mission. Barr joined the IEEE Board of Directors as Treasurer (2013–2014) and implemented the first comprehensive, multiyear summary of IEEE's infrastructure expenses to provide a consolidated view of infrastructure including the depreciation and maintenance costs of IT-related projects. At the Society level, Barr's contributions to the IEEE Microwave Theory and Techniques Society (MTT-S) included roles as President (2002), 2006 International Microwave Symposium General Chair, and 2012 Radio & Wireless Week General Chair.

An IEEE Life Fellow and recipient of the 2013 IEEE MTT-S N. Walter Cox Award, Barr was a Research and Development Manager/Director (retired) with Agilent Technologies/Hewlett-Packard, Santa Rosa, CA, USA.

Scope: For outstanding volunteer service to the IEEE.

IEEE Honorary Membership

Sponsored by IEEE



Sir James Dyson

For achievements in industrial design, entrepreneurship, and manufacturing technology, and for services to the engineering profession

The developer of the world's first bagless vacuum cleaner and many other novel products pervasive in today's society, Sir James Dyson has reignited the spirit of invention around the world and championed the role that engineering and design can play in affecting positive change. Creating a multibillion-dollar industry based on his own inventions, Dyson is a shining example of how perseverance in the face of failure can lead to great accomplishments. Unhappy with the suction performance of a new vacuum cleaner, Dyson developed the idea of a bagless system using cyclonic separation to create a vacuum that would not lose suction as it picked up dirt. Over the course of five years and over 5,127 prototypes later, Dyson perfected his concept and introduced the G-Force cleaner. Facing industry opposition in the United Kingdom, Dyson brought the product to Japan in 1983. Despite being limited only to catalog sales, the cleaner was very popular in Japan, and Dyson used the proceeds to build his own company in Britain. He was then able to launch the Dyson DC01 vacuum in 1993, and it quickly became Britain's best-selling vacuum. Dyson is committed to creating environments that position engineering as an attractive option for students seeking careers in science and technology, so he launched the James Dyson Foundation in 2002. Encouraging students to realize their engineering potential by thinking differently and by not being afraid to make mistakes, the Foundation provides resources for schools and also awards students for innovative product designs. Dyson has also demonstrated his commitment to engineering and design innovation by supporting research facilities such as a new technology hub at Cambridge University and the Dyson School of Design Engineering at Imperial College London.

A member of the United Kingdom Order of Merit and Fellow of the Royal Society of London, Dyson is the chief executive officer of Dyson Company, Malmesbury, Wiltshire, UK.

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

IEEE Alexander Graham Bell Medal

Sponsored by Nokia Bell Labs

H. Vincent Poor

For fundamental contributions to signal processing and its application to digital communications

Continually expanding the frontiers of digital communications, H. Vincent Poor's development of advanced signal processing methods for wireless networks not only eased the early transition to digital mobile networks but also plays a key role in advancing today's communications systems in which the need for new capacity must overcome the challenges of bandwidth limitations. During the 1980s and early 1990s, Poor tackled the obstacles of interference and insufficient capacity with innovations in interference mitigation that allowed wireless receivers to operate effectively in areas limited by interference. His fundamental work on multiuser detection includes the concept of turbo multiuser detection, which introduced the principle of cross-layer interaction in wireless networks; adaptive methods, which allow for interference suppression while having only limited knowledge of the structure of the interference; and space-time methods applicable to the multiple antenna systems that have been integral to the success of modern high-capacity networks. These contributions have impacted modern mobile technology, satellite systems, and local-area networks, coinciding with the rise of widespread consumer wireless communications and providing key methodologies for addressing the explosive demand for capacity. Poor's recent work has focused on communications problems arising in emerging smart-grid and social networking applications, including the development of privacy-preserving communication techniques. Poor has also introduced new approaches based on game theory for modeling the behavior of wireless networks of autonomous terminals.

An IEEE Life Fellow and member of the U.S. National Academies of Engineering and Sciences, Poor is the Michael Henry Strater University Professor of Electrical Engineering at Princeton University, Princeton, NJ, USA.

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

IEEE Simon Ramo Medal

Sponsored by Northrop Grumman Corporation

John S. Baras

For exceptional contributions to the conception and commercialization of internet-over-satellite systems, and for leadership in model-based engineering, systems science, and engineering research

Recognized worldwide as a visionary leader of systems engineering, John S. Baras' development, commercialization, and advancement of Internet-over-satellite (IoS) systems created a new industry that is bringing fast Internet services to tens of millions of people who may otherwise not have access. During the 1990s, the commercial use of satellites was limited to broadcast television applications. However, Baras envisioned a system in which direct broadcast satellites could utilize small satellite dishes to deliver Internet service and customers could send information to the Internet using ordinary telephone modems. The result was the first-ever fast asymmetric IoS system. While it was believed that IoS would never be a viable product, Baras provided the technical breakthrough of modifying transmission control protocol (TCP) to overcome its natural failure in the presence of physical delay by incorporating connection splitting, address spoofing, and selective acknowledgement to inform the TCP protocol that a delay in receiving a request at the receiver end was due to the satellite's physical path delay and not congestion. Working with Hughes Network Systems, Baras commercialized IoS to provide inexpensive high-speed Internet connectivity even to rural and undeveloped areas, and it has greatly impacted applications including telemedicine, disaster relief, and ship communications. Baras also provided innovations for secure operation of IoS, such as layered encryption security, which has become an international standard. As founding director of the University of Maryland's Institute for Systems Research (ISR), Baras has championed the development of model-based systems engineering (MBSE) with a foundational framework that has been successfully applied to industrial applications. He has demonstrated MBSE methodologies to be essential for addressing challenges in software-intensive systems; modular product development in the automotive, aerospace, and energy industries; cyber-physical systems; and smart manufacturing.

An IEEE Life Fellow and fellow of the U.S. National Academy of Inventors, Baras is a professor at the University of Maryland, College Park, MD, USA.

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

IEEE James H. Mulligan, Jr. Education Medal

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

Stephen P. Boyd

For inspirational education of students and researchers in the theory and application of optimization

Stephen P. Boyd has revolutionized the field of optimization as an essential core of many engineering disciplines through immensely popular courses, foundational textbooks, and open-source software tools. Teaching some of the largest graduate courses at Stanford University, Boyd's classes target a wide range of engineers and scientists and have introduced thousands of students to convex optimization techniques. His graduate course on Introduction to Convex Optimization with Engineering Applications evolved into the Convex Optimization I/II courses, which attract over 300 students representing 25 departments. Similar courses based on the materials he has developed at Stanford are taught at universities worldwide. Among his influential textbooks, Boyd's 2004 *Convex Optimization* (with L. Vandenberghe) has become one of the most highly cited books on optimization. It introduces readers to the mathematical theory and algorithms for convex optimization and teaches them through numerous examples how to build convex optimization models for practical applications. A strong proponent of open-source initiatives, Boyd takes pride in making his books, software, and course materials publicly available. This includes his CVX optimization parser-solver program for MATLAB, which has become an invaluable tool for optimization classes and research. Software developed by Boyd's research group has lowered the threshold to optimization technology for nonexperts and has greatly expanded the use of optimization in industry. His website serves as an indispensable resource for students and researchers and receives more than 1.6 million visits per year. A sought-after speaker for lectures and short courses around the world, Boyd is known for energizing his audiences and inspiring them to take the power of optimization further.

An IEEE Fellow and member of the U.S. National Academy of Engineering, Boyd is the Samsung Professor in the School of Engineering and professor of electrical engineering, with courtesy appointments in the Department of Management Science and Engineering and the Department of Computer Science Engineering, at Stanford University, Stanford, CA, USA.

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

IEEE Founders Medal

Sponsored by the IEEE Foundation

Takeo Kanade

For pioneering and seminal contributions to computer vision and robotics for automotive safety, facial recognition, virtual reality, and medical robotics

Shaping the field of computer vision since its infancy, Takeo Kanade, beginning with his Ph.D. thesis in 1973 on computer face recognition, has demonstrated the real-world value of robotics to industries ranging from automotive to medical with concepts often ahead of their time. It was Kanade's pioneering work since the mid 1980s that paved the way for today's driverless cars with one of the first demonstrations of robotics technology for a driverless vehicle. He incorporated computer vision systems and other sensors to detect lane lines and other cars and to control both steering and speed automatically. This culminated in 1995 with the NavLab autonomous land vehicle, which drove 3,000 miles across the United States under autonomous control. Kanade's impact on medicine can be seen in his early image overlay system that gave surgeons X-ray-like vision in visualizing anatomic structures inside a patient. It was one of the first systems to demonstrate what is now commonly referred to as medical augmented reality, and this work was closely related to his development of the HipNav surgical navigation system for orthopedics research. In what he calls virtualized reality, Kanade developed the EyeVision camera system, in which a camera operated by one person drives 30 additional remote cameras to enable three-dimensional freeze-frame views of an activity. The successful debut of EyeVision at Super Bowl XXXV in 2001 brought enormous attention to computer vision and spurred research in the field. To address his lifelong passion for developing robotics to assist people in their everyday activities, Kanade led the creation of Quality of Life Technology Center at Carnegie Mellon University to help develop intelligent systems to transform the lives of people with disabilities or reduced capabilities due to aging.

An IEEE Fellow and member of the U.S. National Academy of Engineering, Kanade is the U.A. and Helen Whitaker University Professor of Computer Science and Robotics at Carnegie Mellon University, Pittsburgh, PA, USA.

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

IEEE Medal for Innovations in Healthcare Technology

Sponsored by the IEEE Engineering in Medicine and Biology Society

Yulun Wang

For pioneering contributions to remotely operated surgical robots and telemedicine devices

The innovations of Yulun Wang concerning remotely operated surgical robots and his development and application of telemedicine systems have improved the quality of healthcare around the world, providing care to patients who otherwise would not have access and lowering the costs of treatment. Pursuing his vision that surgical robotic tools could enable surgeons to perform procedures with increased dexterity and control compared to conventional hand-held instruments, Wang brought medical robots to mainstream research and development and established the role of the surgical robot for minimally invasive surgery. Surgical robots provide the advantages of precision, smaller incisions, decreased blood loss, less pain, and quicker healing time for patients undergoing robotic-assisted surgeries. Wang invented the Automated Endoscopic System for Optical Positioning (AESOP). AESOP is a voice-controlled robotic arm that can hold and move a laparoscope for a surgeon, and it was the first FDA-cleared surgical robot. He also developed the ZEUS robotic surgical system, which performed the world's first trans-Atlantic surgery. Many of the technical innovations developed for ZEUS were incorporated into the very popular da Vinci surgical robot. To improve patient access to quality treatment and to fight the rising costs of healthcare, Wang created the first remote-presence robotic system to enable a clinician to be in two places at one time to perform medical triaging, diagnosis, and consultations from a distance. He applied this system to a tele-stroke treatment network in which a hub hospital places remote presence robots in smaller spoke hospitals to provide these hospitals and their patients with access to stroke specialists who can remotely examine and care for stroke victims. Wang's telemedicine system has also been used for intensive care and psychiatric clinical consults. The surgical robotics and telemedicine innovations that Wang helped to develop have now benefited several million patients—and are continuing to help over a million patients every year.

A member of the U.S. National Academy of Engineering and recipient of the 2005 Innovation Award from the American Telemedicine Association, Wang is chairman and founder of InTouch Health, Goleta, CA, USA.

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

IEEE Richard W. Hamming Medal

Sponsored by Qualcomm, Inc.

Shlomo Shamai

For fundamental contributions to information theory and wireless communications

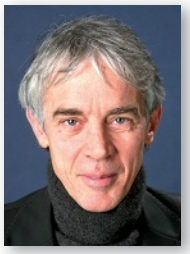
Considered one of the most influential and productive information theorists of today, the fundamental and cutting-edge contributions of Shlomo Shamai have been central to continued progress in wireless communications systems by addressing areas such as channel capacity, secure transmission, and the building blocks for next-generation wireless systems. Multiple-input, multiple-output (MIMO) technology multiplies the capacity of wireless communications networks, and Shamai has provided the most conclusive results on MIMO broadcast channels as an enabler of capacity expansion. He demonstrated that Costa (dirty paper) coding is the fundamental method for capacity-optimal signaling. His work has inspired much follow-up research toward the goal of achieving full capacity in MIMO broadcast channels. Shamai is among the first who introduced large random matrix concepts into information theory, which has had important implications for analyzing the performance of multiuser detection algorithms and quantifying the theoretical limits of multiantenna communication. Shamai and his collaborators provided inspiring and fundamental analytic connections between information and estimation in a Gaussian regime. His outage capacity concept has spanned beyond information theory as a useful tool to study the impact of antenna design on channel capacity. Shamai was instrumental in developing an understanding of efficient communications of fading channels, where severe interference from obstacles and propagation can degrade signal quality. He was among the first to study cellular communications in the fading regime and also presented the concept of block-fading channels. This concept has become a standard model allowing for progress in understanding fading channels. Shamai's recent work has addressed a rich variety of aspects in cooperative cellular communication models and physical-layer security in wireless networks, including developing basic security results for MIMO systems and characterizing the ability of fading broadcast channels to support variable-rate secured data transmission. He is also contributing to the foundations for cloud-based radio networks and next-generation (5G and beyond) wireless network architectures.

An IEEE Fellow and recipient of the 2011 Claude E. Shannon Award, Shamai is a Distinguished Professor, The Andrew & Erna Viterbi Faculty of Electrical Engineering, Technion-Israel Institute of Technology, Haifa, Israel.

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

IEEE Jack S. Kilby Signal Processing Medal

Sponsored by Texas Instruments, Inc.



Martin Vetterli

For fundamental contributions to advanced sampling, signal representations, and multirate and multiresolution signal processing

One of the founding fathers of filter bank and wavelet theory, the signal processing algorithms and architectures developed by Martin Vetterli have helped advance the audio coding, image compression, and wireless technologies critical to our multimedia communications world. Vetterli's Ph.D. thesis established a theory of filter banks and efficient implementations that made filter banks an essential signal processing tool and launched a new wave of applications. In this research he proposed multidimensional subband coding, which is now an integral component of the JPEG2000 image compression standard. His concept of perfect transmultiplexing now allows designers to perfectly modulate signals onto a single channel, enabling orthogonal frequency division multiplexing in WiFi systems. And his concept of nonseparable multidimensional filter banks are used in today's high-dimensional image and video processing methods. Vetterli then went on to propose solutions for joint source-channel coding based on multiresolution concepts. This work has been critical to enabling video over the Internet. He also introduced multiresolution for broadcast television, which allows graceful degradation and backward compatibility between HDTV and standard television. His contributions to joint source-channel coding for video multicasting over the Internet accommodates multiple users with varying channels or access rates. Vetterli has also made groundbreaking contributions to sampling and quantization techniques for bridging the analog and digital worlds. He derived a new sampling theory for signals of finite rate innovation related to compressed sensing, which provides improvements to oversampling methods for analog-to-digital conversion (ADC). This permits high bandwidth signals with low-dimensional representation to be sampled at radically lower bandwidth signal with a low-dimensional representation to be sampled at radically lower rates. Vetterli's work on FRI has made compressed sensing one of the hottest topics in signal processing and has important implications for the design of new ADCs, cameras, radars, and medical imaging devices.

An IEEE Fellow, Vetterli is the president of and a professor in the School of Computer and Communications Sciences at Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland.

Scope: For outstanding achievements in signal processing.

IEEE Jun-ichi Nishizawa Medal

Sponsored by the Federation of Electric Power Companies, Japan

Ching W. Tang, Stephen R. Forrest, and Mark E. Thompson

For their pioneering work on organic devices, leading to organic light-emitting diode displays

The pioneering achievements of Ching W. Tang, Stephen R. Forrest, and Mark Thompson in developing, advancing, and commercializing light-emitting diodes (OLEDs) have created a multibillion-dollar industry for advanced lighting and display applications. OLED technology features a series of thin light-emitting fields to provide brighter light but with less energy compared to traditional LED bulbs and liquid-crystal displays (LCDs). It was the groundbreaking discoveries of Tang during the late 1970s that thin-film devices could emit light when a forward voltage was applied that demonstrated the potential of OLED technology and spurred a new field focused on developing organic optoelectronic devices. He created the organic heterojunction, implemented the double-layer structure for enhancing the efficiency of electron hole recombination, developed new approaches for efficient electrodes, and discovered important emitter materials. Based on Tang's accomplishments, the first full-color active matrix OLED displays were commercialized.

Building on Tang's OLED foundations, Forrest and Thompson took the technology to the next level by recognizing that OLED efficiency was being limited by the spin of excited states. They introduced iridium-based phosphorescent dyes that increased internal OLED efficiency from 25% to near 100% and enabled OLEDs to compete with LCDs. To overcome the belief that OLEDs would never be stable enough for use in commercial electronic devices, Universal Display Corporation (UDC) was founded to tackle OLED performance and stability issues. With UDC, Forrest and Thompson engineered electron and hole balance in the emissive layer using multiple new "guest and host" materials in conjunction with new device design and demonstrated high-efficiency red and green OLEDs with less than 5% degradation over multiple years of continuous use at display brightness. Their work fueled the launch of today's multibillion-dollar OLED industry that provides the display technologies dominating mobile electronic appliances and large-screen, high-definition televisions.

An American Physical Society Fellow and member of the U.S. National Academy of Engineering, Tang is a professor at the Hong Kong University of Science and Technology, Kowloon, Hong Kong, and a professor at the University of Rochester, Rochester, NY, USA.

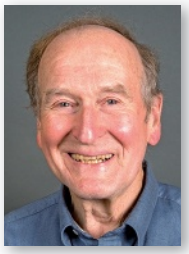
An IEEE Life Fellow and member of the U.S. National Academy of Engineering and the U.S. National Academy of Sciences, Forrest is the Peter A. Franken Distinguished University Professor and Paul G. Goebel Professor of Engineering at the University of Michigan, Ann Arbor, MI, USA.

A U.S. National Academy of Inventors Fellow and recipient of the Alexander von Humboldt Research Award (2015), Thompson holds the Ray R. Irani Chair of Chemistry, Materials Science, and Chemical Engineering at the University of Southern California, Los Angeles, CA, USA.

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

IEEE Robert N. Noyce Medal

Sponsored by Intel Foundation



Henry I. Smith

For contributions to lithography and nanopatterning through experimental advances in short-wavelength exposure systems and attenuated phase-shift masks

With over five decades of pioneering contributions and "well-before-their-time" inventions, Henry I. Smith's nanopatterning technologies have been critical to the semiconductor industry's ability to produce the high-performance, low-cost electronics we take for granted today. Smith pioneered the field of nanofabrication and helped establish it as an academic discipline through his publications and by founding the Nanostructures Laboratory at the Massachusetts Institute of Technology. Among his many important contributions to nanopatterning are the attenuated phase-shift mask and liquid-immersion lithography. He demonstrated that using a partially transparent metal film to attenuate an optical signal, while simultaneously inverting its phase, yields a sharper intensity gradient in patterns on semiconductor wafers. Improved image contrast and higher resolution for dense and isolated features were made possible. Smith's attenuated phase-shift mask is now used in manufacturing practically every high-performance semiconductor chip. Smith was also the first to demonstrate enhanced resolution in optical-projection lithography with liquid immersion, long before the semiconductor industry anticipated the need for such methods. In liquid immersion, the shorter effective wavelength of light enables a higher numerical aperture, allowing deep-sub-wavelength patterning of features on the wafer surface. Smith's work inspired the development of what is now the state of the art in nanolithography for the latest high-performance chips. Smith also demonstrated that soft x-ray lithography can be used to fabricate sub-100-nm structures and complicated integrated circuits. This led to extreme ultraviolet lithography, which many consider the main contender for future integrated circuit manufacturing.

An IEEE Life Fellow and member of the U.S. National Academy of Engineering, Smith is a Professor Emeritus with the Massachusetts Institute of Technology, Cambridge, MA, USA.

Scope: For exceptional contributions to the microelectronics industry.

IEEE Dennis J. Picard Medal for Radar Technologies and Applications

Sponsored by Raytheon Company

Hugh Griffiths

For technical leadership and exceptional contributions to multistatic radar

A world-renowned radar researcher, Hugh Griffiths' pioneering work on multistatic radar and creating and advancing passive radar technologies changed traditional thinking of radar methods and has provided solutions for dealing with the challenges of increasing spectrum congestion. Utilizing nonradar transmitters, passive radar uses bistatic techniques. Griffiths conducted some of the first experiments on passive bistatic radar and published the first paper on the topic. Although real-time signal processing constraints initially proved to be challenging, he overcame early roadblocks to create the commensal passive bistatic radar, in which broadcast or communications waveforms, such as television signals, are optimized not only for their primary function but also as radar signals. Griffiths' work spurred further research into passive radar, the results of which can be seen in today's technologies where passive radar receivers with embedded high-performance computers may provide an alternative to active radars for operation in spectrally congested environments. Griffiths has also led a program to measure the bistatic radar signatures of sea clutter and small maritime targets. He helped develop a unique multistatic radar system called NetRAD that demonstrated bistatic sea clutter as less spiky than monostatic clutter and provided performance advantages of several decibels. Called "clutter diversity," this work is being extended to other radar frequencies and configurations. He also initiated and led a program using synthetic aperture sonar to detect and classify objects such as naval mines, pipelines, or wrecks using an autonomous underwater vehicle incorporating algorithms that correct for irregular vehicle motion and propagation inhomogeneities through seawater. The results, featuring well-focused images of targets at ranges in excess of 200 meters with spatial resolution of a few centimeters, were some of the first of their kind.

An IEEE Fellow and Fellow of the U.K. Royal Academy of Engineering, Griffiths is the THALES/Royal Academy Chair of RF Sensors in the Department of Electronic and Electrical Engineering at University College London, London, UK.

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

Marian P. Kazmierkowski

For leadership in and pioneering contributions to the development of power electronic converters and electric drive control systems

With a career dedicated to improving the performance and availability of modern electric drives, Marian P. Kazmierkowski's pioneering innovations to processing and controlling the flow of electric energy using power electronic converters have impacted applications ranging from industrial machines to transportation systems to renewable energy sources. Kazmierkowski developed the first speed sensorless vector control system for high-power current-source inverter-fed induction motor drives. He also invented current control methods for transistor voltage source inverters with reduced switching frequency that have been used in a commercial series of transistor pulse-width-modulation (PWM) inverter-fed alternating current (ac) servo drive systems manufactured in Poland. His digital-signal-processing-based sensorless control system has improved the performance of induction motors used for drives in trams, trolleys, and subways, permitting a wide range of speed and torque adjustments while enabling full utilization of the direct current voltage supply. The work done by Kazmierkowski and his team has had important implications for renewable energy applications. He has created methods for ac sensorless direct power control of three-phase grid connected PWM converters based on the concept of "virtual flux," which have been used for active and reactive power estimation. He has also developed power electronics grid interfaces for Europe's Wave Dragon offshore ocean-wave renewable energy converter. Controllers based on his theories can also be found in photovoltaic systems and wind farm converters. In 2003 Kazmierkowski founded the Centre of Excellence in Power Electronics and Intelligent Control for Energy Conservation at the Warsaw University of Technology, which has become an internationally recognized leader of power electronics research and teaching.

An IEEE Life Fellow and Full member of the Polish Academy of Sciences, Kazmierkowski is a professor with the Institute of Control and Industrial Electronics, Warsaw University of Technology, Warsaw, Poland.

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 John von Neumann Medal

Sponsored by IBM Corporation

Vladimir Vapnik

For the development of statistical learning theory, the theoretical foundations for machine learning, and support vector machines

A living legend in the field of machine learning largely responsible for its historical and current success, Vladimir Vapnik has shaped the way modern researchers address the challenges of machine learning and how the field is practiced every day in applications ranging from large computer systems such as Google and Facebook to next-generation smart devices. Vapnik, with colleague Alexey Chervonenkis, developed the fundamental basis of statistical learning theory, which is at the foundation of practically all machine-learning techniques. Vapnik established an approach to machine learning based on the principle of fitting available training data while balancing the complexity of the learned model (known as the Vapnik-Chervonenkis dimension). This work helped researchers to understand basic issues about the nature of learning in general, and about what it means for a model or a theory to be simple or complex. It has provided the mathematical foundations for the entire optimization-based approach to machine learning. Another of Vapnik's breakthroughs was the support vector machine (SVM) algorithm, which has become one of the most widely used techniques in machine learning. Building on Vapnik's statistical learning theory, this computationally efficient learning algorithm satisfies strong generalization guarantees. When combined with kernel functions, SVMs produce a highly flexible learning system for a wide range of data types and inductive biases, effectively using a linear-separator learning algorithm to perform well even for data requiring highly nonlinear separation boundaries. SVMs have been applied to a tremendous range of commercial, governmental, scientific, and academic problems, from spam and fraud detection, to the face detector in an iPhone, to supporting cutting-edge biological discoveries.

A member of the U.S. National Academy of Engineering and recipient of the Benjamin Franklin Medal (2012), Vapnik is a professor with the Department of Computer Science at Columbia University, New York, NY, USA, and a research consultant with Facebook AI Research, Menlo Park, CA, USA.

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

IEEE Medal for Environmental and Safety Technologies

Sponsored by Toyota Motor Corporation

Alberto Broggi

For leadership in vehicular environmental perception, and for setting worldwide milestones in safe and reliable intelligent vehicles

Alberto Broggi's innovations in vehicular perception have played an integral part in milestone projects in the development and advancement of intelligent vehicles, increasing awareness of the safety and environmental benefits driverless vehicles can bring to the world. With an early vision of the potential for the driverless vehicle, a hallmark of Broggi's work has been to incorporate low-cost machine vision sensors such as cameras for vehicle perception instead of the more costly laser-based sensors. Broggi led the "MilleMiglia in Automatico" project in 1998, which was the first test of autonomous driving using off-the-shelf components. Demonstrating the importance of artificial vision for safety, this project involved driving over 2,000 km on regular roads with real traffic in Italy. Lessons learned from MilleMiglia led to perception systems developed by Broggi's that were installed on the TerraMax 14-ton driverless truck. TerraMax competed in the U.S. Defense Advanced Research Project Agency's Grand Challenge project and was the only driverless vehicle to reach the finish using vison as its primary sensor. In 2010 he organized the VisLab Intercontinental Autonomous Challenge, which was the longest-ever test for driverless vehicles. Four electric vans equipped with sensors and actuators were driven on a 13,000-km route from Parma, Italy, to Shanghai, China, providing invaluable data for improving autonomous driving systems. Another milestone came in 2013 when Broggi's lab tested the BRAiVE vehicle in downtown Parma, which negotiated two-way narrow rural roads, pedestrian crossings, traffic lights, and roundabouts in the middle of the day. The test required no human intervention and represented the first time an autonomous vehicle was driven on public roads with no one in the driver's seat for part of the test.

An IEEE Fellow and recipient of multiple grants from the European Research Council, Broggi is full professor at the University of Parma, Italy and currently general manager of VisLab, a University of Parma spinoff company recently acquired by Silicon Valley company Ambarella.

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 Edison Medal

Sponsored by Samsung Electronics Co., Ltd.

M. George Craford

For a lifetime of pioneering contributions to the development and commercialization of visible LED materials and devices

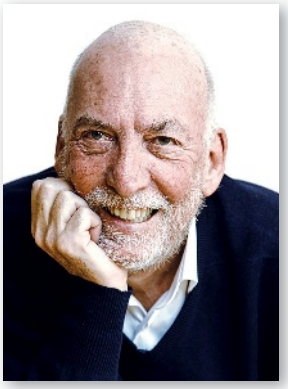
An innovator of light-emitting diode (LED) technology for over 45 years, M. George Craford's pioneering contributions are illuminating the world with higher-efficiency, lower-cost, and more environmentally friendly solid-state alternatives to traditional incandescent light bulbs. Using gallium arsenide phosphide technology, Craford created the first yellow LED and increased the performance of red LEDs by ten. Craford then led the development of the world's highest-performance red, orange, and amber LEDs based on aluminum gallium indium phosphide (AlGaInP), demonstrating 100 lumens per watt (lm/W). To achieve this, Craford focused on using metal organic chemical vapor deposition (MOCVD), which at the time was considered high risk for low-cost LED manufacturing. However, Craford had the vision to realize that MOCVD technology was evolving and was critical to making high-volume production of efficient LEDs a reality. Craford and his team led the development of processes for the successful, high-volume, commercial implementation of MOCVD for LEDs. Today, almost all of the world's multibillion-dollar LED industry is based on MOCVD. Further advances by Craford and his team incorporating compound semiconductor wafer bonding enabled yellow-orange-red spectrum AlGaInP LEDs with efficiencies exceeding unfiltered incandescent lamps. Another first was an LED with efficiency exceeding 100 lm/W, revolutionizing the LED industry and ushering in the viability of solid-state lighting. Craford's team then led the field in the development and commercialization of the first high-power, high-brightness LEDs with an output greater than 10-20 lm across the entire visible spectrum. These high-power white LEDs were used in the creation of the first LED light bulbs to meet the requirements of the U.S. Department of Energy's "L Prize," awarded to a company that could provide, on a commercial scale, an LED light bulb to replace the conventional 60W incandescent bulb.

An IEEE Life Fellow and recipient of the 2015 U.S. National Academy of Engineering Charles Stark Draper Prize and the 2002 National Medal of Technology, among other awards, Craford is currently Solid State Lighting Fellow at Lumileds LLC, San Jose, CA, USA.

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

IEEE Medal of Honor

Sponsored by the IEEE Foundation



Kees Schouhamer Immink

For pioneering contributions to video, audio, and data recording technology, including compact disc, DVD, and Blu-ray

Regarded as the most prolific contributor to the world's consumer electronics of the late 20th Century, Kees Schouhamer Immink fueled the "big bang" of digital electronics with pioneering coding techniques that have provided the foundation for all generations of optical storage media, from the compact disc (CD) to the Blu-ray disc (BD). A multitalented pioneer in technical areas ranging from coding theory and practice to electronics, mechanics, and optics, Immink has inspired generations of theorists and engineers and has made a lasting impact on how we handle data. Immink established the area of constrained codes as an important subfield of information and coding theory, and his myriad of practical coding constructions have accelerated the development of digital data storage technology. Immink's eight-to-fourteen modulation (EFM) technique for digital recordings improved playing time and was more robust to dust, fingerprints, and disc damage such as scratches, leading to the creation of the CD. The introduction of the CD in 1982 marked the beginning of the change from analog to digital sound technology. It quickly revived a sluggish music industry and essentially replaced the traditional music delivery methods of vinyl records and cassette tapes. This optical storage technology also provided low-cost, high-capacity, flexible data storage exceeding what computer hard drives could accommodate at that time.

Building on his EFM technology, Immink developed an advanced channel coding method called EFMPlus, which was integral to the design of the digital versatile disc (DVD). Offering higher storage capacity than the CD, but at the same dimensions, the DVD is able to store any kind of digital data from computer software to video programs. Upon its introduction in 1995, the DVD became the fastest adopted consumer electronics product and generated billions of dollars for the film industry. While the DVD was quickly replacing traditional video cassettes, Immink was already working on further advancements to his original inventions by developing an even higher-density optical disc format. This work evolved into the BD, which can handle high-definition content suitable for feature films and video games.

Immink was also among the first engineers to conduct experiments with optical recordable and erasable media, bringing the mini disc, CD-R, DVD-R, and BD-R formats into the homes of consumers. He also added to realizing broadcast-quality recording products for consumers with his contributions to the digital video camcorder.

With approximately 500 billion CDs, DVDs, and BDs estimated to be in use today, Immink's inventions have impacted people all over the world. As recognition of Immink's role in the digital media revolution, his honors include an Emmy award from the U.S. National Academy of Arts and Sciences, induction into the Consumer Electronics Hall of Fame, and knighthood by Queen Beatrix of the Netherlands.

An IEEE Life Fellow, foreign member of the U.S. National Academy of Engineering, and recipient of the 1999 IEEE Edison Medal, Immink is president of Turing Machines, Inc., Rotterdam, the Netherlands.

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 2017 IEEE Technical Conferences

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IEEE Biomedical Engineering Award

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

Bin He

For contributions to neuroengineering and neuroimaging

The pioneering work of Bin He has transformed electroencephalography (EEG) from a one-dimensional detection modality to an important noninvasive three-dimensional neuroimaging tool for brain research and management of brain disorders. He developed anatomically constrained brain source localization by introducing the boundary element method, which has significantly advanced the field of multimodal neuroimaging. He has changed the understanding of what noninvasive brain-computer interfaces (BCIs) can do. Using an array of electrode sensors placed over the scalp, He developed novel BCI techniques to demonstrate that a human can control the flight of a drone with their mind through reading the EEG signals. He's neuroimaging innovations are playing an important role in the diagnosis and management of disorders including epilepsy, stroke, and Alzheimer's disease.

An IEEE Fellow, He is the Distinguished McKnight University Professor of Biomedical Engineering and director of the Institute for Engineering in Medicine at the University of Minnesota, Minneapolis, MN, USA.

IEEE Cledo Brunetti Award

Sponsored by the Brunetti Bequest

Guido Groeseneken

For contributions to the characterization and understanding of the reliability physics of advanced MOSFET nanodevices

Guido Groeseneken has been dedicated to tackling the most critical reliability issues facing the continued scaling of semiconductors to help enable today's smaller, more powerful, and more efficient electronics. He developed the charge pumping technique, which quickly became a powerful method for the characterization of metal-oxide semiconductor field-effect transistor (MOSFET) devices. He used the technique to better understand hot-carrier injection, which allowed the semiconductor industry to optimize technologies to achieve longer lifetimes. He and his team developed the percolation model to explain time-dependent dielectric breakdown, identified transient charging effects as a limitation to the commercialization of high-*k* dielectrics, and developed a measurement method to quantify these effects. His work has facilitated the development of very thin, high-*k* materials important to the further miniaturization of micro- and nanoelectronic devices.

An IEEE Fellow, Groeseneken is a Research Fellow with IMEC and professor with the KU Leuven, Belgium.

IEEE Components, Packaging, and Manufacturing Technology Award

Sponsored by the IEEE Components, Packaging, and Manufacturing Technology Society

Paul S. Ho and King-Ning Tu

For contributions to the materials science of packaging and its impact on reliability, specifically in the science of electromigration

The patented innovations of Paul S. Ho and King-Ning Tu overcame the roadblocks caused by electromigration that limited high-performance chip reliability for the semiconductor and electronics industry. First addressing the issues with aluminum wiring, then copper, and eventually solder-bump connections, their work provided the foundation to understanding the science of the failure mechanisms and guided high-performance chip designs and manufacturing processes that enabled high-volume manufacturing of many silicon nodes with low cost and high reliability. Ho and Tu also provided insights and solutions regarding the failure mechanisms associated with low-k dielectric materials, tin whiskers, and electromigration in interconnects critical to the success of high-performance flip-chip technologies.

An IEEE Fellow, Ho is director of the Laboratory for Interconnect and Packaging at the University of Texas at Austin, Austin, TX, USA. Tu is the TSMC Chair Professor at National Chiao Tung University, Hsinchu, Taiwan.

IEEE Control Systems Award

Sponsored by the IEEE Control Systems Society

Richard M. Murray

For contributions to the theory and applications of nonlinear and networked control systems

Richard M. Murray's efforts in applying control techniques to improve engineering and industrial processes are impacting applications including autonomous vehicles, networked control systems, and synthetic biology. Murray's work in autonomous vehicles include advances in nonlinear control theory that exploit geometric structure for real-time trajectory generation and tracking, as well as analysis and design of cooperative and consensus-based control systems for networked, multiagent systems. Murray's contributions to molecular and synthetic biology include identification, modeling, and design techniques to allow bioengineers to analyze and synthesize biological pathways and circuits inside living cells. Murray's group has also developed computationally tractable approaches for synthesis of reactive control protocols applicable to control systems in which the decision-making logic satisfies safety, fairness, and reactivity constraints.

An IEEE Fellow, Murray is the Thomas E. and Doris Everhart Professor of Control and Dynamical Systems and Bioengineering at the California Institute of Technology, Pasadena, CA, USA.

IEEE Electromagnetics Award

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

Weng Cho Chew

For contributions to electromagnetic solutions of complex multiphysics problems and inverse scattering methods

Weng Cho Chew's pioneering contributions to computational electromagnetics have made solutions to large real-world problems possible, greatly impacting a diverse range of fields including device design, antennas, and photonics. Among Chew's fast solvers that make it possible to simulate the electromagnetic behavior of structures of unprecedented size, his multilevel fast multipole algorithm (MLFMA) changed the size of problems that can be solved by six orders of magnitude, permitting the solution of problems of enormous geometrical complexity. Chew's numerical mode matching method has become the standard technology in electromagnetic well logging tools for the oil industry and is also used to solve microwave and optical waveguide problems. His distorted Born iterative method for multiple scattering inverse problems and multiphysics methods are impacting disciplines beyond electromagnetics.

An IEEE Fellow, Chew is a Fisher Distinguished Professor of Engineering with the University of Illinois, Urbana-Champaign, Urbana, IL, USA.

IEEE James L. Flanagan Speech and Audio Processing Award

Sponsored by the IEEE Signal Processing Society

Mark Yoffe Liberman

For pioneering contributions to and continued leadership in robust, replicable, and data-driven speech and language science and engineering

Mark Yoffe Liberman's trailblazing efforts in creating the Linguistic Data Consortium (LDC) have fueled the development and advancement of human language technologies (HLTs) including speech and speaker recognition, machine translation, and semantic analyses. Founded at the University of Pennsylvania in 1992, the LDC became the largest developer of shared language resources, distributing more than 120,000 copies of over 2,000 databases covering 91 different languages to more than 3,600 organizations in over 70 countries. Liberman has also helped to create a speech activity detector that regularly processes LDC speech data to reduce annotation cost and increase accuracy and a forced aligner that was integrated into the Forced Alignment and Vowel Extraction service that has revolutionized phonetic and sociolinguistic research.

Liberman is the Christopher H. Browne Distinguished Professor of Linguistics and director of the Linguistic Data Consortium at the University of Pennsylvania, Philadelphia, PA, USA.

IEEE Fourier Award for Signal Processing

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

Russell Mersereau

For sustained technical contributions to multidimensional digital signal processing

A "founding father" of multidimensional signal processing, Russell Mersereau has been a pioneer in developing the fundamental concepts, methodologies, and tools in sampling, representing, and processing digital signals of two and higher dimensions. His *Multidimensional Signal Processing* (Prentice-Hall, 1984) was the first textbook on this subject and remains the field's definitive resource. His work on two-dimensional digital filtering, hexagonal sampling, and reconstruction of multidimensional signals from their projections has directly impacted diverse fields including crystallography, fluorescence microscopy, medical imaging, and robotics. Mersereau cofounded Atlanta Signal Processors, Inc. (now part of Polycom, Inc.) to take multidimensional signal processing from the classroom to commercial success.

An IEEE Fellow, Mersereau is a Regents' Professor Emeritus with the School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA, USA.

IEEE Andrew S. Grove Award

Sponsored by the IEEE Electron Devices Society

Sorin Cristoloveanu

For contributions to silicon-on-insulator technology and thin body devices

A visionary device physics researcher, Sorin Cristoloveanu saw the potential that silicon-on-insulator (SOI) technology held for the semiconductor industry in producing competitive microelectronics components with improved performance when others considered it a niche field. As early as 1976, he discovered key mechanisms of thin-body devices that have led to the development of transistors from the simplest (zero gate) to the most complicated (four gates). Among several concepts unveiled by his group, the demonstration during the 1980s that volume inversion occurs in all nano-body devices was revolutionary at the time and helped drive research that led to double-gate transistors and today's tri-gate FinFET devices. His Pseudo-MOSFET method developed in 1992 has become an industry standard for wafer monitoring without having to actually fabricate devices. More recently, Cristoloveanu's SOI expertise has led to innovative devices for low-power memory and sharp-switching circuits.

An IEEE Fellow, Cristoloveanu is the director of research at CNRS at IMEP-LAHC, Grenoble, France.

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

George Dorwart Rockefeller

For pioneering development and practical demonstration of protective relaying of electric power systems with real-time digital computer techniques

George Dorwart Rockefeller's prescient work on how to use computers to provide real-time analysis of voltages and currents for fault detection laid the foundation for today's digital protection, control, and monitoring of the electric power grid. Known as "the father of digital protection," Rockefeller invented the concept of on-line, real-time protective relaying of electric power systems in 1967 while with Westinghouse Electric Corporation—well before the advent of microprocessors made it a cost-effective reality. His development of the Prodar 70 digital relay, installed in a California transmission substation in 1971 by Westinghouse and Pacific Gas and Electric, transformed protective relaying of power systems and set the standards for modern microprocessor relay products. Rockefeller's contributions inspired the industry to look at protection and control in a completely new, and smarter, way.

An IEEE Life Fellow, Rockefeller is retired and works as an engineering consultant in Laguna Hills, CA, USA.

IEEE Masaru Ibuka Consumer Electronics Award

Sponsored by Sony Corporation

John O' Sullivan, David Skellern, and Terence Percival

For pioneering contributions to high-speed wireless LAN technology

The efforts of John O'Sullivan, David Skellern, and Terence Percival in developing and commercializing high-speed WiFi provided the milestone technology for practically all in-home and local area mobile Internet communications. O'Sullivan initiated and led the early efforts in techniques for very high-speed wireless networks at Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO). Percival took over and led the CSIRO project that modeled and prototyped the high-speed modulation schemes and hardware needed for successful WiFi communications. Working in conjunction with CSIRO, Skellern led a pioneering project on wireless local area networks at Macquarie University and in 1997 cofounded, with Percival and Neil Weste, Radiata Communications to commercialize the CSIRO-Macquarie research. O'Sullivan joined Radiata in 1999. In 2000 Radiata demonstrated the first working WiFi system based on the IEEE 802.11a 5-GHz standard.

An IEEE Senior Member, O'Sullivan is a physicist and electrical engineer (retired) in NSW, Australia. An IEEE Life Fellow, Skellern is chairman of CMCRC Ltd, Sydney, Australia. Percival is an electrical engineer and director of TMPP Pty Ltd, Northbridge, Australia.

IEEE Internet Award

Sponsored by Nokia Corporation

Deborah Estrin

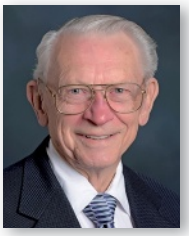
For formative contributions and thought leadership in Internet routing and in mobile sensing techniques and applications, from environmental monitoring to personal and community health

Deborah Estrin's innovative ideas and leadership have combined to realize powerful new ways of adapting the Internet to applications of great importance to modern society. Estrin helped design the replacement of the Internet's original global routing protocol and also championed multicast protocols, which support aggregate communication among a collection of hosts compared to traditional point-to-point communication. She was the founding director of the National Science Foundation's Center for Embedded Networked Sensing (CENS), which pioneered the development of mobile and wireless systems to collect and analyze real-time data about the physical world and the people who occupy it. She then applied this participatory sensing technology to improving health outcomes as the undisputed thought leader in mobile health (mHealth) applications.

An IEEE Fellow, Estrin is a professor of computer science at Cornell Tech, New York, NY, USA.

IEEE Richard Harold Kaufmann Award

Sponsored by the IEEE Industry Applications Society



Erling Hesla

For leadership in establishing the fundamentals for the protection and safe operation of industrial power systems

With a career dedicated to developing practical approaches to improving electrical safety, Erling Hesla has championed the safe switching and clearing of power systems through critical contributions and by educating engineers. He developed the first software-driven analytical approach to the planning and control of lockout/tagout analysis for qualified operators to confidently perform the switching and clearing of complex power distribution systems. Hesla led the creation of IEEE Standard 902-1988 (Guide for Maintenance, Operation and Safety of Industrial and Commercial Power Systems), which was the first IEEE standard to provide guidance for safe workplace practices regarding industrial electrical systems. Considered the accepted expert in applying safe switching procedures, Hesla has also disseminated his safety knowledge to engineers worldwide through his consulting practice, many publications, and numerous lectures.

An IEEE Life Senior Member, Hesla is owner of Hesla & Associates, Camano Island, WA, USA.

IEEE Joseph F. Keithley Award in Instrumentation and Measurement

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

Jerome Blair

For contributions to test procedures for analog-to-digital and digital-to-analog converters and to enhanced-accuracy gamma-ray spectrometry.

The innovations developed by Jerome Blair concerning analog and digital converters and waveform recorders have improved efficiency of equipment and benefited national security efforts. His sine wave histogram tests provided a new way to thoroughly test analog-to-digital converters for integral and differential nonlinearity and missing codes using significantly less data than previous methods. His improvements enabled much shorter test times and relaxed the requirements on test equipment. Blair patented an algorithm to quantify gamma-ray radial energy deposition in conventional semiconductor detectors, to aid the detection of contraband nuclear materials. His work has enabled size and weight reduction of portable detection systems and increased sensitivity of fixed stations monitoring traffic by eliminating background radiation coming from directions other than a particular vehicle.

An IEEE Fellow, Blair is a chief scientist with Keystone International, Inc., Albuquerque, NM, USA.

IEEE Gustaff Robert Kirchhoff Award

Sponsored by the IEEE Circuits and Systems Society

Marcel J.M. Pelgrom

For seminal contributions to systematic analysis of random offsets in semiconductor devices and their impact on circuits

Known to circuit designers around the world for his formulation of the random variation (mismatch) behavior between two otherwise identical components, Marcel J.M. Pelgrom has dramatically impacted the efficiency of analog designers. An essential performance metric for optimization, the "Pelgrom model" provides the device and design community with an elegant description for mismatch. Mismatch characterization is important because statistical variations between individual devices critically affect the performance of analog circuits. Due to device scaling and power supply reduction, the impact of local variability increases to a level where even full-swing noise margins in digital memories are affected. Pelgrom's model will remain instrumental in achieving optimized solutions in many types of semiconductor devices, creating lasting economic benefits.

An IEEE Member, Pelgrom is a consultant with Pelgrom Consult, Helmond, the Netherlands.

IEEE Leon K. Kirchmayer Graduate Teaching Award

Sponsored by the Leon K. Kirchmayer Memorial Fund

C.-C. Jay Kuo

For inspirational guidance of graduate students and curriculum development in the area of multimedia signal processing

Ask students and colleagues to describe C.-C. Jay Kuo and you will hear words such as "passionate teacher," "outstanding scholar," "great professional leader," and "unparalleled innovator." Since 1989 at the University of Southern California, Kuo has taught over 3,000 students, guided over 130 students to Ph.D. degrees, and supervised 25 postdoctoral research fellows. His Introduction to Digital Image Processing is one of the most popular courses among electrical engineering graduate students, and he continually revises the curriculum to address current trends. His Multimedia Data Compression graduate course is based on his own lecture notes. Keys to Kuo's popularity in the classroom are his enthusiastic teaching style and his broad and deep knowledge of the technology and product trends of the multimedia industry.

An IEEE Fellow, Kuo is a Dean's Professor in Electrical Engineering at the University of Southern California, Los Angeles, CA, USA.

IEEE Koji Kobayashi Computers and Communications Award

Sponsored by NEC Corporation

Kannan Ramchandran

For pioneering contributions to the theory and practice of distributed source and storage coding

The methods developed and made practical by Kannan Ramchandran for distributed source coding and distributed storage coding are benefiting image and video communications and large data storage systems. Ramchandran connected distributed source coding theory to channel coding approaches that could be applied to real applications, such as video. To overcome the unreliability of nodes in large distributed systems where data is stored over multiple nodes for redundancy, Ramchandran created regenerating codes. With these codes, he demonstrated how considerably less data is needed to be transferred over the network when a failed node is repaired, while maintaining minimal storage overhead. Variants of these codes have saved companies like Microsoft hundreds of millions of dollars in data center costs and will be part of future releases of the Apache Hadoop open-source framework.

An IEEE Fellow, Ramchandran is a professor of electrical engineering and computer science with the University of California, Berkeley, Berkeley, CA, USA.

IEEE William E. Newell Power Electronics Award

Sponsored by the IEEE Power Electronics Society

Seung-Ki Sul

For contributions to the sensorless control of rotating field electrical machines

An international leader in power electronics technologies, Seung-Ki Sul's innovations concerning sensorless control techniques are improving the reliability and reducing the cost of motor drive systems critical to a wide range of applications. Sul developed a sinusoidal pulsating injection method for sensorless control to realize high-performance alternating-current motor control without using a position or speed sensor even at low speeds. Sul's methods have been commercialized and applied to motion and traction control in elevators to enable smooth starting, oil pump drives in automobiles that reduce cost and improve vehicle reliability, sensorless traction motors in electric and hybrid vehicles, and even washing machines. His recently developed sensorless drive featuring pulsating square wave voltage has important implications for traction control in humanoid robots.

An IEEE Fellow, Sul is a professor with Department of Electrical and Computer Engineering at Seoul National University, Seoul, Korea.

IEEE Daniel E. Noble Award for Emerging Technologies

Sponsored by the Motorola Solutions Foundation

Miguel A.L. Nicolelis

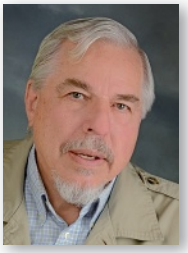
For seminal contributions to brain-machine interfaces

In creating the field of neuroengineering, Miguel A.L. Nicolelis' pioneering work on brain-machine interfaces has completely changed people's perception of what brains can do and how such research can be rapidly applied to help humans. Nicolelis demonstrated that humans can use raw brain activity to directly communicate with mechanical, electronic, and virtual devices in real time and in a closed control loop. He played a key role in the development of a robotic exoskeleton that can help paralyzed individuals to walk. He focused on methods to read a paraplegic person's brain waves and decode and use them to move hydraulic drivers on the suit. His work has great implications for patients with epilepsy, Parkinson's disease, and spinal cord injury.

An IEEE Member, Nicolelis is the Duke School of Medicine Distinguished Professor of Neuroscience at Duke University, Durham, NC, USA.

IEEE Donald O. Pederson Award in Solid-State Circuits

Sponsored by the IEEE Solid-State Circuits Society

Takao Nishitani and John S. Thompson

For pioneering real-time programmable digital signal processor architectures

The groundbreaking contributions of Takao Nishitani and John S. Thompson to the development of the first single-chip, real-time programmable digital signal processors (DSPs) revolutionized communications networks and changed how society works, is educated, and is entertained. While their work was conducted independently (Nishitani at NEC and Thompson at Bell Labs), it culminated with the simultaneous publication of two pioneering papers at the 1980 IEEE International Solid-State Circuits Conference and, later, the first commercial DSPs. To overcome the bottlenecks that prevented a conventional microprocessor from executing voiceband signal processing algorithms in real time, they chose to modify the computation model developed from the 1950s that had dominated computer architectures. Their concepts featured high-speed, real-time, multiply-accumulate operations via hardware multipliers and split-memory architectures to independently and simultaneously address program instructions. Their realization of DSPs has played an important role in the development of the advanced networks and devices we take for granted today.

An IEEE Life Fellow, Nishitani is a principal with LAISIP, Kanagawa, Japan. An IEEE Life Senior Member, Thompson is retired in Tucson, AZ, USA.

IEEE Frederik Philips Award

Sponsored by Philips Electronics N.V.

Gary L. Patton

For industry influence and leadership in the development of leading-edge microelectronics technology and collaborative research

Gary L. Patton's innovative leadership methods and pioneering contributions have resulted in the development and implementation of semiconductor products that have impacted applications ranging from consumer handheld devices to high-performance servers. Over the past 30 years, he has driven the industry's semiconductor roadmap through senior leadership positions within IBM and GlobalFoundries where he led the development of leading-edge technologies. Among his many technical leadership achievements, Patton drove the introduction of high-performance embedded dynamic random access memory into IBM processors at 45 nm as well as led the development of the IBM Alliance's 32/28-nm high-*k* technologies currently used today in a wide range of consumer and industrial applications. His pioneering work on silicon germanium heterojunction bipolar transistors built the foundation for today's semiconductor components used in cell phones, wireless networks, and global positioning system devices.

An IEEE Fellow, Patton is chief technology officer and senior vice president of Worldwide Research and Development with GlobalFoundries, Malta, NY, USA.

IEEE Photonics Award

Sponsored by the IEEE Photonics Society

John E. Bowers

For pioneering research in silicon photonics, including hybrid silicon lasers, photonic integrated circuits, and ultra-low-loss waveguides

The pioneering efforts of John E. Bowers to advancing hybrid silicon photonics is transforming the way computers connect and how data moves around the world, improving business and consumer experiences via thin strands of fiber with silicon photonics on either end. Bowers developed a bonding process that overcomes the challenges of trying to get light out of silicon and has demonstrated high-quality photonic devices that can be manufactured at high volumes and low cost. His work on the hybrid silicon laser has made photonic integrated circuits in silicon a reality, which is critical to enabling lower-cost, higher-speed, and smaller-footprint devices to meet the bandwidth needs of Internet service providers and to create the data centers of the future.

An IEEE Fellow, Bowers is director of the Institute of Energy Efficiency, University of Santa Barbara, Santa Barbara, CA, USA.

IEEE Robotics and Automation Award

Sponsored by the IEEE Robotics and Automation Society

Oussama Khatib

For contributions to the development of robot control and human-centered and humanoid robotics, and leadership in the robotics community

Oussama Khatib's 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. Khatib 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 group created macro-mini actuation for greater safety in medical robotics and in applications where humans work in close proximity to robots. Khatib's 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.

An IEEE Fellow, Khatib is a professor with the Department of Computer Science at Stanford University, Stanford, CA, USA.

IEEE Frank Rosenblatt Award

Sponsored by the IEEE Computational Intelligence Society

Stephen Grossberg

For contributions to understanding brain cognition and behavior and their emulation by technology

Stephen Grossberg's foundational work on modeling how brain mechanisms give rise to behavior functions has played an important role in understanding the human mind and enabling machines to adapt to unexpected changes. The ability of his models to adapt autonomously in real time to unexpected environments makes them suitable for applications including image processing, pattern recognition and prediction, and robotics. He is best known for his Adaptive Resonance Theory, which concerns how the brain can learn new objects without forgetting previously learned patterns. He also developed the concept of Laminar Computing. His principle of Complementary Computing has demonstrated how the brain is organized in pairs of parallel streams that compute complementary processes that allow for trade-offs necessary for adaptive intelligent systems.

An IEEE Fellow, Grossberg is the Wang Professor of Cognitive and Neural Systems at Boston University, Boston, MA, USA.

IEEE Marie Sklodowska-Curie Award

Sponsored by the IEEE Nuclear and Plasma Sciences Society

Chandrashekhar Joshi

For groundbreaking contributions to and leadership in the field of plasma particle accelerators

Chandrashekhar Joshi is overcoming the challenges of providing smaller, more cost-effective versions of arguably the most important instrument of scientific discovery—the high-energy particle accelerator. Acknowledged as the undisputed leader in the drive to make plasma accelerators a reality, Joshi has demonstrated that charged particles can be accelerated thousands of times more rapidly using plasma compared to traditional radio-frequency-wave technology. To reduce the massive size of current machines, Joshi uses powerful laser pulses or charged particle bunches to create charged-density waves in ionized gas. The results achieved by Joshi's plasma accelerator group have led to major national experimental facilities working toward building terra-volt-scale plasma-based particle colliders needed at the frontier of particle physics while reducing their cost.

An IEEE Fellow, Joshi is a Distinguished Chancellor's Professor of Electrical Engineering at the University of California, Los Angeles (UCLA), Los Angeles, CA, USA.

IEEE Innovation in Societal Infrastructure Award

Sponsored by Hitachi, Ltd. and the IEEE Computer Society

Antonello Monti

For accelerating innovation of energy, information, and communication technologies for the urban environment

Antonello Monti's visionary research is delivering advances in providing stable, secure, and efficient energy supply systems in buildings and urban environments. With a focus on automating complex power systems based on network dynamics and information and communication technologies, his power hardware in the loop (PhiL) simulation tools have made it possible to link real-life power equipment to real-time simulation of power systems to validate the impact of dynamics and delay times of algorithms, controllers, converters, and communication systems on electrical distribution grids. He has also been a leader in exploring the potential of cloud-based platforms for complete virtualization of power infrastructures, which will revolutionize how utilities operate by providing service-based energy solutions in extremely short time periods.

An IEEE Senior Member, Monti is a professor and institute director with the E. ON Energy Research Center, RWTH Aachen University, Aachen, Germany.

IEEE Charles Proteus Steinmetz Award

Sponsored by the IEEE Standards Association

David John Law

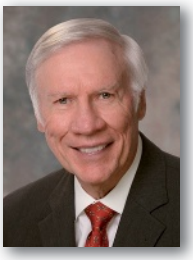
For leadership of and contributions to the development of IEEE Standards with global impact, particularly 802.3 Ethernet Standards

David John Law has inspired a rich culture of professionalism, transparency, and a drive to "go the extra mile" to ensure the quality of IEEE 802.3 Ethernet and other IEEE standards. His contributions share a central theme of demystifying standards and demonstrating the value of a rigorous standards development process. As chair of the IEEE 802.3 Ethernet Working group, under Law's leadership the breadth of the IEEE 802.3 Ethernet Standard has grown beyond enterprise and campus networks as he has worked to see important expansion of capabilities into new, diverse applications. Law has provided expert guidance to other standards efforts through his work with the IEEE-SA Standards Board, the IEEE Standards Education Committee, and the IEEE 802 LAN/MAN Standards Committee's University Outreach Program.

An IEEE Senior Member, Law is a distinguished technologist with Hewlett Packard Enterprise, Oban, Argyll, Scotland.

IEEE Eric E. Sumner Award

Sponsored by Nokia Bell Labs



William C. Lindsey

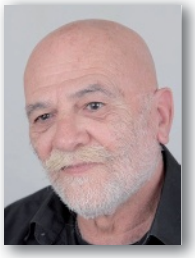
For contributions to synchronization and digital communication technologies

William C. Lindsey's synchronization and communications research has spearheaded the digital communications revolution and created novel technologies for space and mobile wireless communications. Lindsey's work on carrier and clock synchronization methodologies for demodulation and decoder timing significantly improved the performance and efficiency for both data communication and spacecraft tracking and reduced the size, weight, power, and complexity of these devices. Lindsey's digital-data transaction-tracking loop (DTTL) enabled the decoding of the first photos of Mars from NASA's Mariner spacecraft as well as images from the Voyager missions, and it was critical to Space Shuttle and space station communications efforts. It also led to the concept of "digital phase-locked systems on a chip" used in modern mobile radios and localization systems.

An IEEE Life Fellow and member of the U.S. National Academy of Engineering, Lindsey is a professor of electrical engineering at the University of Southern California, Los Angeles, CA, USA.

IEEE Nikola Tesla Award

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



Adel Razek

For contributions to coupled multiphysics modeling and design of electromagnetic systems

Considered one of the most successful multiphysics researchers, Adel Razek's modeling and design tools are responsible for making commercial energy conversion devices more efficient and reliable. He was among the first to develop coupled electromagnetic and circuit analysis and further developed the multiphysics field by adding coupled thermal and mechanical analysis. His work has led to the better understanding of electromagnetics in electrical machinery and electromagnetic devices and has allowed engineers and scientists to achieve higher accuracy in determining the different variables governing the operation of industrial systems and to account for realistic system operation. Other areas impacted by Razek's work include traction in electric vehicle drives, electromagnetic compatibility, nondestructive testing, smart material actuation, robotics, and biomedicine.

An IEEE Life Fellow, Razek is senior research director (emeritus) and professor (honorary) with the National Center for Scientific Research and Centralesupelec, Gif Sur Yvette, France.

IEEE Kiyo Tomiyasu Award

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

Emilio Frazzoli

For contributions to planning, control, and fleet operation algorithms for autonomous vehicles

Emilio Frazzoli is a driving force in developing planning and control algorithms for the safe and reliable operation of autonomous vehicles in real-world environments. Frazzoli has created control software that allows autonomous cars to generate only trajectories that satisfy all "hard rules" (such as "do not hit pedestrians") while satisfying as many "soft rules" ("if possible, stay in left lane") as possible. His Rapidly-exploring Random Trees (RRT) algorithm is considered the state-of-the-art in motion planning. One of his projects helped gain understanding of the impact of autonomous cars on urban mobility. This project featured the first vehicle authorized to drive autonomously on public roads in Singapore using "rules of the road" planning and the first analysis of the social and economic impact of autonomous cars on a city.

An IEEE Senior Member, Frazzoli is a professor with ETH Zürich, Switzerland, and the chief scientist of nuTonomy, Inc., Cambridge, MA, 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

Claire J. Tomlin

For contributions to air transportation systems, focusing on collision avoidance protocol design and avionics safety verification

Claire J. Tomlin's control systems expertise is making air transportation systems safer through collision avoidance techniques and avionics safety verification methods. Tomlin's algorithms allow the development and analysis of control protocols that have guarantees of safety for hybrid system models, which represent the kinds of switched dynamical systems found in air transportation systems. Her work has been tested in simulation, on unmanned aerial vehicle test flights, and flown on commercial platforms. She built one of the first quadrotor testbeds for experimentation with these control protocols. Her methods were used to compute collision zones for two aircraft paired approaches and were flown on a Boeing T-33 test aircraft that was able to avoid collision with an F-15 flying "blunders" into its path. Her work is also integral to the development of the Next Generation Air Transportation System for modernizing air traffic control.

An IEEE Fellow, Tomlin is the Charles A. Desoer Chair in Engineering (EECS) at the University of California, Berkeley, CA, USA.

IEEE Undergraduate Teaching Award

Sponsored by the IEEE Education Society

Bonnie H. Ferri

For pioneering mobile hands-on learning and flipped classroom techniques for undergraduate engineering education

A leader in classroom innovation, the programs developed by Bonnie H. Ferri are transforming undergraduate engineering education for students at the Georgia Institute of Technology and around the world. Ferri is pioneering the use of mobile, hands-on laboratory equipment that allows electrical and computer engineering (ECE) students to perform exercises at home or in class instead of in traditional laboratories. This has also allowed lecture-based courses to now have a laboratory component. Ferri also has improved learning environments by incorporating the latest flipped/blended techniques into the ECE curriculum. In this format, prerecorded lectures are viewed outside of class to allow students to interactively work on problems in the classroom during what would normally be lecture time.

An IEEE Senior Member, Ferri is a professor with the School of Electrical and Computer Engineering at the Georgia Institute of Technology, Atlanta, GA, USA.

2016 IEEE STAFF AWARD

IEEE Eric Herz Outstanding Staff Member Award

Sponsored by IEEE

Karen A. Galuchie

For exceptional staff leadership and for support and service to IEEE volunteers in achieving the philanthropic objectives of the IEEE and the IEEE Foundation

Karen A. Galuchie drives the design and implementation of strategies and programs critical to building a culture of philanthropy within IEEE. Known as a "go-to" person who gets things done, Galuchie ensures that the day-to-day operations of the IEEE Foundation are responsive, effective, efficient, and forward facing. She has been instrumental in developing and deploying the Foundation's strategic direction to further IEEE's mission to foster technological innovation and excellence for the benefit of humanity through philanthropy. A trusted and respected leader, Galuchie credits the success of the Foundation to the highly effective and committed team she has assembled, which is considered among the most engaged and impactful among IEEE staff.

Galuchie was the recipient of the 2010 IEEE Joyce E. Farrell Award and now is executive director of the IEEE Foundation, Piscataway, NJ, 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 2017, 299 IEEE Fellows were elevated. To learn more about the Fellow program or to nominate, visit: www.ieee.org/fellows.

Raviraj Adve
University of Toronto
Toronto, ON, Canada
for development of signal processing techniques for airborne radar

Sos Agaian
University of Texas at San Antonio
San Antonio, TX, USA
for contributions to biologically-inspired visual data processing systems

Alexei Ashikhmin
Bell Labs - Alcatel-Lucent
New Providence, NJ, USA
for contributions to information theory and communication theory

Nadarajah Asokan
Aalto University
Aalto, Finland
for contributions to system security and privacy

Todd Austin
University of Michigan
Ann Arbor, MI, USA
for contributions to simulation techniques and resilient system design in computer architecture

John Ballato
Clemson University
Anderson, SC, USA
for contributions to optical fibers and optoelectronic materials

Hugh Barnaby
Arizona State University
Tempe, AZ, USA
for research of radiation effects in bipolar junction transistors

Janet Barth
NASA Goddard Spaceflight Center
Greenbelt, MD, USA
for leadership in spacecraft reliability and electronic systems

Christopher Barty
Lawrence Livermore Nat'l Laboratory
Livermore, CA, USA
for contributions to ultrahigh intensity lasers and advancement of X-ray and gamma-ray science

Nader Behdad
University of Wisconsin, Madison
Madison, WI, USA
for contributions to sub-wavelength electromagnetic periodic structures

Calin Belta
Boston University
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