



# 2010 OSA Awards

OSA is proud to announce the winners of its 2010 awards and medals. The Optical Society has chosen to honor these distinguished individuals for their dedication, ingenuity and perseverance in attaining the highest level of scientific achievement in their chosen fields. The OSA Board of Directors approved the awards at its meeting in February. Most of these awards will be presented at *Frontiers in Optics*, the 94<sup>th</sup> OSA Annual Meeting, in Rochester, N.Y., U.S.A. in October 2010.

## Frederic Ives Medal/Jarus W. Quinn Endowment

The highest award of the Society, the Ives Medal recognizes overall distinction in optics



>> To **Joseph H. Eberly**, University of Rochester, U.S.A. For many important research contributions to quantum optics and optical physics, his leadership as a teacher and educator, and his tireless and visionary service to the optics community.

Joseph Eberly is a graduate of Pennsylvania State University (B.S.) and Stanford University (Ph.D.). He has been teaching graduate and undergraduate classes in the department of physics and astronomy at the University of Rochester since the 1970s. He is currently the Andrew Carnegie Professor of Physics and also a professor of optics.

His long-time research interests in quantum optics and radiation physics have led to a number of discoveries and innovations, including the initial description of the spontaneous collapse and revival effect, the first observation of Bessel beams, and predictions of the recently observed non-spreading localized states of electrons in atoms, and the sudden-death effect in quantum entanglement.

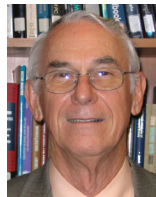
He received the Charles Hard Townes Award from OSA and the Goergen Award for Creative Undergraduate Teaching from the

University of Rochester and has been designated a Distinguished Alumnus of the Penn State College of Science. He was awarded the Smoluchowski Medal by the Polish Physical Society.

Eberly has mentored more than 35 Ph.D. graduates and published more than 350 research papers, as well as three graduate texts: *Optical Resonance and Two-Level Atoms* with L. Allen; *Lasers and Laser Physics*, both with P.W. Milonni. He is the founding editor of the journal *Optics Express*, and he has served as president of OSA and chair of the APS Division of Laser Physics, on the APS Council and the AIP Board of Governors, and as a member of the Advisory Boards of the Kavli Institute for Theoretical Physics and ITAMP-Harvard. He is a Fellow of OSA and APS, and he is an elected Foreign Member of the Polish Academy of Science.

## Esther Hoffman Beller Medal

In recognition of outstanding contributions to optical science and engineering education



>> To **Eustace Dereniak**, University of Arizona College of Optical Sciences, U.S.A. For contributions to optical sciences and engineering education, noting particularly his books on geometrical optics, infrared detectors and infrared systems, his classroom teaching and his mentoring of optics students.

As a professor of optical sciences and electrical and computer

engineering, Dereniak develops optical radiation detectors, imaging spectrometers and imaging polarimeters. He has co-authored several textbooks including *Geometrical and Trigonometric Optics*, published by Cambridge, and *Optical Radiation Detectors and Infrared Detectors and Systems*, published by Wiley-Interscience.

He has written chapters for *Imaging in Medicine*, edited by S. Nudelman and D. Patton, related to research and development using thermograph instrumentation for the early detection of breast cancer. Dereniak has authored or co-authored over 100 refereed articles. Prior to his academic career, Dereniak spent many years in industrial research with Raytheon, Rockwell International and Ball Brothers Research Corporation. He served as a visiting professor with the U.S. Army and Air Force, a research associate with the Air Force's Rome Air Development Center, and a consultant to the University of Hawaii Institute for Astronomy. During the summers, he taught at the University of Michigan, University of New Mexico and University of Central Florida. He is a Fellow of SPIE and OSA, and vice president of SPIE. Most recently, he spent a sabbatical at West Point Military Academy in New York teaching and doing research on polarization propagation.

## Max Born Award

In recognition of contributions to physical optics



>> To **Vladimir M. Shalaev**, Purdue University, U.S.A. For seminal contributions to both the theoretical framework and the experimental realization of optical metamaterials

During his early career Shalaev made pioneering contributions to the optics of fractal and percolation composites and their applications for surface-enhanced Raman spectroscopy. While at Purdue, Shalaev has made several key contributions to the field of optical metamaterials and transformation optics, including the first experimental observation of negative refractive index in the optical range, artificial magnetism across the entire visible range, and novel approaches for imaging with sub-wavelength resolution and optical cloaking. He is the Robert and Anne Burnett Professor of Electrical and Computer Engineering.

Shalaev earned a Ph.D. in physics and mathematics in 1983 from the Siberian Federal University in Krasnoyarsk, Russia. He arrived at Purdue in 2001 after previously holding the position of the George W. Gardiner Professor of Physics at New Mexico State University. He also has conducted research at the Universities of Toronto

(Canada), Heidelberg (Germany), and Paris-Sud (France).

### Distinguished Service Award

*In recognition of service to the optical community*



>> To **Gary C. Bjorklund**, Bjorklund Consulting, U.S.A. For long and distinguished service to the optics profession, including extraordinary leadership in guiding the OSA Foundation through its initial years and leading it to an impressive set of accomplishments.

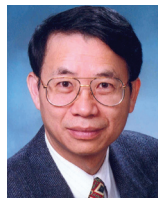
Throughout his career, Bjorklund has combined strong business acumen with scientific know-how. After graduating from MIT and Stanford, he worked at Bell Laboratories performing research in quantum electronics and nonlinear optics. Moving to IBM Research, he directed programs to develop photonics for information technology applications. Since 1994 he has been involved with a number of small companies, such as Optivision/Optical Networks and Nanovation Technologies, as an executive, consultant and board member. In recent years, he has also been an active angel investor in start-up companies in the areas of photonics and solar energy. He is a consulting director for the Stanford Photonics Research Center.

Bjorklund's service to the optics community has been tireless. He served as program chair (1984) and general chair (1986) of CLEO and a member of the CLEO and OFC Steering Committees. In 1986, he was also president of the IEEE Lasers and Electro-Optics Society. He has served OSA as chair of the Technical Council from 1990-1991, chair of the OSA

Annual Meeting in 1995, director-at-large from 1993-1995 and president in 1998. He was also a member of the National Research Council's Committee on Optical Science and Engineering in the late 1990s. Bjorklund was one of the founders of the OSA Foundation and served as the first Chair of its Board of Directors from 2002 to 2008. He is a Fellow of OSA, IEEE and APS.

### Joseph Fraunhofer Award/ Robert M. Burley Prize

*In recognition of significant accomplishments in optical engineering*



>> To **Shin-Tson Wu**, University of Central Florida College of Optics and Photonics, U.S.A.

Shin-Tson Wu is a PREP professor at CREOL, the College of Optics and Photonics, University of Central Florida. His research activities include: liquid crystal displays, liquid crystal materials, laser beam steering, tunable-focus lens, and bio-inspired photonics.

Wu has co-authored six books, seven book chapters and over 350 journal papers. He also obtained 66 patents. He is the founding editor-in-chief of the IEEE/OSA Journal of Display Technology. Prior to joining UCF in 2001, he worked at Hughes Research Laboratories (Malibu, Calif., U.S.A.) for 18 years. Wu received his Ph.D. in physics from the University of Southern California and a B.S. in physics from National Taiwan University. He is a Fellow of the IEEE, OSA, the Society for Information Display (SID) and SPIE. He received the SID Jan Rajchman Prize and SPIE's G.G. Stokes Award.

### Nick Holonyak Jr. Award

*In recognition of significant contributions to optics based on semiconductor-based devices and optical materials, including basic science and technological applications*



>> To **Dan Botez**, University of Wisconsin-Madison, U.S.A. For fundamental contributions to high-power semiconductor lasers including active photonic-crystal structures for high coherent power generation; single-lobe grating-surface-emitting distributed-feedback lasers; and high-power, high-efficiency sources based on aluminum-free technology

Dan Botez is Philip Dunham Reed Professor in the Electrical and Computer Engineering Department at the University of Wisconsin-Madison (UWM).

His research interests are primarily concerned with high-power spatially coherent lasers and intersubband-transition, quantum-confinement semiconductor lasers. He co-invented the first active-photonic-crystal laser for spatial-mode selection and control in wide-aperture (>100 $\mu\text{m}$ ) devices (1988), the intersubband quantum-box laser (1997), the surface-emitting laser with central grating  $\pi$  phase-shift (2000) and the deep-well quantum-cascade laser (2003).

Botez is co-founder of Alfalight Inc., Madison, Wis., U.S.A. Before joining UWM, he worked at TRW Research Center and RCA David Sarnoff Research Center. Botez is a Fellow of OSA and IEEE, and he was awarded the "Doctor Honoris Causa" degree by the Polytechnical University of Bucharest, Romania (1995). He was elected Technical Fellow of TRW and was selected as the Photonics Society's Outstanding Young Engineer (1984). He also received the 1979

RCA Outstanding Achievement Award.

He has served on the IEEE/Photonics Society Board of Governors and as general co-chair of the IEEE/OSA 2007 CLEO meeting. In 1984, he co-founded the IEEE/Photonics Society Semiconductor Laser Workshop, which is now held annually. He has published four book chapters and 270 journal papers; he has given about 80 invited and plenary presentations; and he holds 47 patents. He received B.S. (with highest honors), M.S. and Ph.D. degrees from the University of California, Berkeley.

### Edwin Land Medal

*In recognition of pioneering work empowered by scientific research to create inventions, technologies, and products (co-sponsored with the Society for Imaging Science and Technology)*



>> To **Eli Peli**, The Schepens Eye Research Institute, U.S.A. For pioneering research, clinical, and entrepreneurial contributions to providing enhanced imagery for people with impaired vision through image processing, innovative optical designs, fiber optics, and applications of vision science

Eli Peli's principal research interests are image processing in relation to visual function and clinical psychophysics in low vision rehabilitation, image understanding, image quality and





the evaluation of display-vision interaction. He is also studying control of eye movements and binocular vision. Peli invents, develops and evaluates optical and electro-optical devices to improve function for impaired vision. He emphasizes enhancing the experience of TV viewing and facilitating safe mobility on foot or while driving.

Peli received a BSEE and MSEE from the Technion-Israel Institute of Technology and doctorate from New England College of Optometry. He is the Moakley Scholar in Aging Eye Research and a co-director of research at Schepens Eye Research Institute, as well as a professor of ophthalmology at Harvard Medical School. Peli is a Fellow of OSA, the American Academy of Optometry, the Society for Information Display and SPIE.

**OSA Leadership Award**

*In recognition of an individual or group of optics professionals who has made a significant impact on the field of optics and/or made a significant contribution to society*



>> To **Rod C. Alferness**, Bell Laboratories, Alcatel-Lucent, U.S.A. For broad and inspiring leadership in terms of governing premier societies, chairing prestigious conferences, leading the research arm of Bell Laboratories, and spearheading the multi-institutional MONET consortium.

Rod Alferness's early research included the invention of novel waveguide electro-optic devices and circuits—including switch/modulators and the first re-configurable optical add/drop multiplexer (ROADM)—and their applications in high capacity lightwave networks. This work enabled development of titanium diffused lithium niobate waveguide modulators, which are deployed in global fiber-optic

transmission systems. He made contributions to INP photonic integrated circuits, including widely tunable lasers, and to photonic switching systems. He was an originator of the DARPA-funded MONET project, which demonstrated the feasibility of the wavelength routed optical networks that are now deployed for backbone and metro networks.

Alferness is the chief scientist at Bell Laboratories, Alcatel-Lucent. He has been at Bell Labs since 1976 except for three years when he served as the chief technical officer of Lucent's Optical Networking business. Alferness is a member of the National Academy of Engineering and a recipient of the 2005 IEEE Photonics Award. He served as president of OSA in 2008 and of the IEEE Lasers and Electro-Optics Society in 1997. He was a general co-chair of OFC and editor-in-chief of the Journal of Lightwave Technology. He serves on the ECOC Executive Management Committee.

**Emmett N. Leith Medal**

*In recognition of seminal contributions to the field of optical information processing*



>> To **Juris Upatnieks**, University of Michigan/Environmental Research Institute of Michigan (retired), U.S.A. For his pioneering and seminal contributions to the development of practical holography and its applications, including the co-invention (with Emmett Leith) of the off-axis hologram, the development of compact optical correlators and the introduction of edge-illuminated holograms.

Juris Upatnieks was instrumental in solving the twin-image problem in holography by using the carrier-frequency method of recording, hologram recording with short coherence light sources and exploring hologram imaging characteristics. He investigated hologram applications

such as hologram microscopy, holographic optical elements, hologram displays in education, and holographic weapons sights. He also investigated compact coherent optical correlator designs, how to address multiple filters in real time, and non-contact optical measurement and alignment techniques.

Upatnieks arrived in the U.S. in 1951 from Riga, Latvia. He received a BSEE from the University of Akron, Ohio, in 1960, and an MSEE from University of Michigan in 1965. From 1960 until retirement in 2001, he worked at the University of Michigan and the Environmental Research Institute of Michigan in the areas of holography and coherent optics.

**Ellis R. Lippincott Award**

*In recognition of contributions to vibrational spectroscopy (co-sponsored with the Coblenz Society and the Society for Applied Spectroscopy)*



>> To **Martin Moskovits**, University of California at Santa Barbara, U.S.A. For fundamental and continuing contributions to the field of Surface-Enhanced Raman Spectroscopy and proposing its fundamental enhancing mechanism based on the excitation of localized surface plasmons.

Martin Moskovits is a professor of physical chemistry in the Department of Chemistry and Biochemistry at the University of California at Santa Barbara. His research interests have included surface spectroscopy; thin film electronics and optics; matrix isolation spectroscopy; Raman optical activity; surface-enhanced Raman spectroscopy (in which he was first to propose the plasmonic origin of the effect); plasmonics including plasmonic enhancement and plasmonic conductance; nanotechnology, including the development of nanofabrication

techniques in anodic alumina templates; single-nanowire sensor and single-nanowire electronics and photonics.

Moskovits served as chief technology officer of API Technologies Inc. and president of API's Nano-Opto division, a company manufacturing nano-optics from 2007 to 2010. He was Susan and Bruce Worster Dean of Science at the University of California at Santa Barbara from 2000 to 2007. He began his career at the University of Toronto as a professor of chemistry in 1972 and served in that position for 28 years. He was chair of the department from 1993 to 1999. Moskovits holds degrees in physics and chemistry from the University of Toronto. He is the author or co-author of over 280 technical papers and inventor on 18 patents.

**Adolph Lomb Medal**

*In recognition of noteworthy contributions made to optics before reaching the age of 35*



>> To **Jeremy O'Brien**, University of Bristol, U.K. For seminal contributions to quantum optics, optical quantum metrology and quantum information through the foundation of the field of integrated quantum photonics.

Jeremy O'Brien is a professor of physics and electrical engineering at the University of Bristol. His doctoral research involved experimental work on correlated and confined electrons in organic conductors, superconductors and semiconductor nanostructures, as well as progress towards the fabrication of phosphorus in a silicon quantum computer. His work in the field of experimental quantum optics and quantum information science has included demonstrations of quantum logic gates on photons, quantum metrology, quantum measurement and integrated quantum photonics.

As director of the Centre for Quantum Photonics (CQP) ([www.phy.bris.ac.uk/groups/cqp/](http://www.phy.bris.ac.uk/groups/cqp/)), O'Brien oversees research on fundamental and applied quantum mechanics at the heart of quantum information science and technology, ranging from prototypes for scalable quantum computing to generalized quantum measurements, quantum control and quantum metrology. O'Brien received his Ph.D. in physics from the University of New South Wales in 2002. He was a research fellow at the University of Queensland from 2001 to 2006.

#### William F. Meggers Award

*In recognition of outstanding work in spectroscopy*



>> To **Frédéric Merkt**, ETH Zürich, Switzerland. For ground-breaking work on the ultrahigh resolution spectroscopy of Rydberg states of atoms and molecules, and for the refinement of high-resolution photoelectron spectroscopy and its application to the determination of the structural and dynamical properties of molecular cations.

Frédéric Merkt and his group investigate the properties of high Rydberg states of atoms and molecules using laser spectroscopy in the vacuum ultraviolet, the extreme ultraviolet and the terahertz range. They also study the photoionization of atoms and molecules at high spectral resolution using a variety of multiply resonant photoexcitation schemes. His group is also exploring new ways to control the translational motion of atoms and molecules in gas-phase inhomogeneous electric and magnetic fields.

Merkt holds a degree in chemistry from ETH Zürich and a Ph.D. from Cambridge University, England. He was a postdoctoral researcher at the

Université de Paris-Sud, Orsay (1992) and at Stanford University (1994). From 1992 to 1995, he held a junior research fellowship at St. John's College, Oxford. Merkt returned to ETH Zürich in 1995 as an assistant professor of physical chemistry and became a full professor in 1999. He has received the Swiss National Latsis Prize, the Alfred Werner Prize of the Swiss Chemical Society, the AkademiPreis der Berlin-Brandenburgischen Akademie der Wissenschaften and the Carus Prize and Medal of the Deutsche Akademie der Naturforscher Leopoldina. He is a member of the Deutsche Akademie der Naturforscher Leopoldina.

#### David Richardson Medal

*In recognition of contributions to optical engineering, primarily in the commercial and industrial sector*



>> To **Kenneth E. Moore**, Zemax Development Corporation, U.S.A. For the development of state-of-the-art optical design and analysis software combining the capabilities required by the expert designer and the ease of use and accessibility needed for an occasional optics analysis user.

Kenneth Moore's primary research focus is on making advanced numerical modeling tools for use in commercial software products. Recently his work has centered on fast and efficient numerical modeling and automated optimization and design of non-imaging systems. Early in his career he worked on optimizing physical optics systems. This work expanded to the application of numerical modeling and optimization techniques to imaging system design software. Moore has also investigated optical modeling of birefringent crystals, holograms and gradient index materials.

Moore received a B.S. in physics from California State University, Los Angeles, U.S.A., in 1984. After four years in industry, he enrolled in graduate school at the University of Arizona Optical Sciences Center. In 1989, Moore started his own company. After completing his Ph.D. in 1991, Moore went to the Lawrence Livermore National Laboratory (LLNL) to work on prototype optics for what is now the National Ignition Facility. He left LLNL to run his company full-time in 1992. That start-up evolved into what is now known as ZEMAX Development Corporation, where Moore serves as president and primary software architect.

#### Edgar D. Tillyer Award

*In recognition of distinguished work in the field of vision, including (but not limited to) the optics, physiology, anatomy or psychology of the visual system*



>> To **Stephen A. Burns**, Indiana University School of Optometry, U.S.A. For outstanding contributions to the understanding of the photoreceptor mechanisms through electrophysiology, psychophysics, optics and in vivo retinal imaging

Stephen A. Burns' research quantifies the information transformation within the early visual system, including the optics of the eye. His work combines advanced instrumentation, basic vision science and the investigation of the pathophysiology of disease. He has developed novel techniques for assessing the structure and function of the cone photoreceptors, and he has studied the temporal properties of the retina. He is currently using adaptive optics imaging to study the structure and function of the retina.

Burns received his Ph.D. in biophysics from Ohio State University. After postdoctoral research at the University of Chicago in vision science and optics, he built new research programs at the University of Pittsburgh, then the Schepens Eye Research Institute. He is currently a professor of optometry at Indiana University. Burns is a Fellow of OSA, the Association for Research in Vision and Ophthalmology and the American Academy of Optometry. He is a former editor of the Journal of the Optical Society A.

#### Charles H. Townes Award

*In recognition of outstanding contributions to quantum electronics*



>> To **Atac Imamoglu**, The Institute of Quantum Electronics, ETH Zürich, Switzerland. For his seminal contribution to electromagnetically induced transparency and pioneering work on quantum information processing with quantum dots.

Atac Imamoglu's research interests are at the interface between quantum optics and condensed-matter physics. During the last decade, he has investigated quantum optical phenomena in solid-state emitters, such as quantum dots or defects, embedded in photonic nano-structures, where he was particularly interested in understanding physical properties that distinguish these solid-state systems from their atomic counterparts. His current research



## Wang and Wu to Receive Joseph W. Goodman Book Writing Award

### Lihong Wang and Hsin-i Wu

will receive the 2010 Goodman Book Writing Award, a biennial award that recognizes a recent and outstanding book in the field of optics and photonics that has contributed significantly to research, teaching, or the optics and photonics industry. Wang and Wu's award-winning book, *Biomedical Optics: Principles and Imaging*, was selected by a joint OSA/SPIE award committee.

In choosing the book, the committee noted that it is proving to be an invaluable resource for researchers in the field and for the next generation of scientists. Published by John Wiley & Sons in 2007, the book has been adopted by courses at top universities around the world. The Goodman award is funded by a personal gift from Joseph W. and Hon Mai Goodman.

Lihong Wang has pioneered a number of optical techniques for biomedical applications including frequency-swept ultrasound-modulated optical tomography, dark-field confocal photoacoustic microscopy (PAM), optical-resolution PAM, photoacoustic Doppler sensing, photoacoustic reporter gene imaging and microwave-induced thermoacoustic tomography. PAM broke through the long-standing diffusion limit of conventional optical microscopy and reached super-depths for functional and molecular imaging in living tissue. His Monte Carlo model of photon transport in scattering media is used worldwide.

Wang holds the Gene K. Beare Distinguished Professorship at Washington University. He edited the first book on photoacoustic tomography. He has published 211 peer-reviewed journal articles and delivered 236 invited talks. He has served as principal investigator on 21 research grants totaling more than \$25 million. He is a Fellow of AIMBE, IEEE, OSA and SPIE. He serves as the editor-in-chief for the *Journal of Biomedical Optics*. He also co-chairs the annual conference on Photons plus Ultrasound.

Now retired from Texas A&M University, Hsin-i Wu's early research focused on small-angle X-ray scattering theory. However, beginning in the mid-1970s, his research dealt primarily with biosystems modeling: Working under the auspices of an UN project on sustainable eco-agricultural system in Loess Plateau of China; and collaborating with Water Resources Division of CSIRO-Australia on the salinity project in Murray-Darling Basin. Most recently, he worked on a type-2 diabetes self-management project.

Wu received his Ph.D. in mathematical physics from University of Missouri, Columbia, in 1967. He taught at Southeast Missouri State University from 1967 to 1976. He joined Biosystems Research Group as a senior research scientist at Texas A&M University in 1976, and he was appointed as a professor of bioengineering in 1987. He retired from the department of biomedical engineering at Texas A&M University, in September 2009. Wu serves on the editorial boards of *Biocomplexity* and *Biomedical Engineering OnLine*.



Wang



Wu

predominantly focuses on using quantum optical techniques for studying many-body phenomena in mesoscopic systems.

Imamoglu has been professor of physics at the ETH Zürich since December 2002. At ETH, he leads the Quantum Photonics research group. Imamoglu, born in Minneapolis, Minn., U.S.A., has dual U.S.-Turkish citizenship. He graduated from the Middle East Technical University and received his Ph.D. from Stanford University in 1991. His dissertation examined electromagnetically induced transparency and lasers without inversion.

### John Tyndall Award

*In recognition of contributions to fiber optic technology (co-sponsored with IEEE Photonics Society)*



>> To **C. Randy Giles**, Bell Labs, Alcatel-Lucent, U.S.A.. For seminal contributions to advanced lightwave communications networks including erbium-doped fiber amplifiers, fiber Bragg grating-based subsystems, and MEMs crossconnects.

C. Randy Giles is currently director of the Optical Subsystems and Advanced Photonics Department, Bell Laboratories, Alcatel-Lucent. He pioneered the modeling and use of erbium-doped fiber amplifiers for lightwave systems, demonstrated the first optical add/drop multiplexers by means of Bragg-grating technology and developed optical network applications of micromachines including scalable optical cross-connects and add/drop multiplexers. He continues to lead and participate in many innovative projects, including new optical network architectures, 100Gb/s transport technology, optical signal processing and a miniaturized laser-based data projector for the next generation of

mobile multimedia devices.

Giles graduated from the Universities of Victoria (B.Sc., physics, 1976; M.Sc. physics, 1978) and Alberta (Ph.D., electrical engineering, 1983) in Canada. Before joining Bell Laboratories in 1986, he worked at Nortel's research labs on their first gigabit optical transmission systems. Giles is an OSA Fellow and he was named the 2001 Bell Laboratories Fellow. He received the Discover Award in 2000 for the invention of the MEMS-based optical crossconnect switch, and the Fraunhofer Award/Burley Prize from OSA in 2004. In 2008 Giles was honored as Laureate of the Millennium Technology Prize from the Finnish Government for the development of the erbium-doped fiber amplifier.

### Herbert Walther Award

*In recognition of distinguished contributions in quantum optics and atomic physics as well as leadership in the international scientific community (co-sponsored by OSA and Deutsche Physikalische Gesellschaft)*



>> To **Serge Haroche**, Ecole Normale Supérieure (ENS) and Collège de France, France. For using the techniques of quantum optics and atomic physics to creatively illuminate the mysterious world near to the quantum classical border, where waves become particles and ordinary physics emerges from the quantum domain.

Currently a professor at Collège de France, where he holds the chair of quantum physics and doing his research at ENS, Haroche has spent nearly four decades investigating problems in quantum optics. He has made key contributions to the field of cavity quantum electrodynamics, a branch of quantum optics. His work provides new information about the fundamental aspects

of quantum physics, describes the boundary between the quantum and classical realms, and offers new avenues to process quantum information.

Though much of his research has occurred at ENS, he has shared his expertise at a number of institutions worldwide including the University Pierre and Marie Curie, Paris, Stanford, Yale, Harvard, and MIT. Haroche counts among the many prizes and awards he has received the Grand Prix Jean Ricard of the French Physical Society, the Einstein Prize for Laser Science, the Quantum Electronics Prize from EPS, the Quantum Communication Award from the International Organization for Quantum Communication, Measurement and Computing, OSA's Townes Award and the 2009 Médaille d'Or of the French Centre National de la

Recherche Scientifique (CNRS). He is a member of the French Academy of Sciences and an APS Fellow.

#### R.W. Wood Prize

*In recognition of an outstanding discovery, scientific or technological achievement or invention*



>> To **Henry C. Kapteyn** and **Margaret M. Murnane** of JILA, University of Colorado, U.S.A. For critical advances in the science and technology of high-harmonics generation, with particular relevance to sub-femtosecond pulse generation and related attosecond-scale physics.

Henry Kapteyn and Margaret Murnane have made important contributions to the development

of coherent x-ray sources and have helped establish the foundations of attosecond science. In the 1990s, they led the development of new ultrafast laser technologies using Ti:sapphire to generate unprecedented high peak power pulses only a few optical cycles in duration. They then did pioneering work in developing an understanding of extreme nonlinear optics to efficiently upshift femtosecond laser light into the soft X-ray region of the spectrum.

Henry Kapteyn is professor of physics and Fellow of JILA, University of Colorado, Boulder. He holds a B.S. from Harvey Mudd College, M.S. from Princeton University and a Ph.D. from the University of California, Berkeley. He previously held faculty positions at Washington State University and the University of Michigan. He is a Fellow of OSA, APS, and AAAS, and recipient of

the OSA Adolph Lomb Medal, the ACS Ahmed Zewail Award, and the APS Arthur Schawlow Prize.

Margaret Murnane is professor of physics and Fellow of JILA, University of Colorado Boulder. She received her BS and MS degrees from University College Cork, Ireland, and her Ph.D. from the University of California, Berkeley. She previously held faculty positions at Washington State University and the University of Michigan. She is member of the NAS, a Fellow of OSA, APS and AAAS, and recipient of a MacArthur Foundation Fellowship, the ACS Ahmed Zewail Award and the APS Arthur Schawlow Prize.

