

APL Achievement Awards and Prizes

Linda L. Maier-Tyler

The passion for excellence, the drive to innovate, and the hard work that underlies any successful enterprise are the qualities that sustain APL's reputation as a leader among premier engineering organizations. To promote initiative and reward exceptional work, APL conducts annual awards programs to recognize individuals whose work from the previous year advances science, technology, and education through tangible achievement in technical publications, independent research and development projects, and out-of-the-box innovative thinking leading to the invention of new technologies.

The Invention of the Year Awards program encourages new technology and innovation at APL and identifies the top technology from the preceding year. For the 2011 competition, 460 APL researchers disclosed 259 inventions. The disclosures were judged by an independent review panel of technical and business consultants, technology transfer professionals, and intellectual property attorneys. Judges based their selections of the winning technologies on creativity, novelty, improvement over existing technology, commercial potential, and probable benefit to society. Last year, a Government Purpose Innovation Award was established to recognize an invention that specifically meets a critical need of a sponsor. Of the 259 inventions, one was selected for the Invention of the Year Award and one received the Government Purpose Innovation Award.

Since its establishment in 1989, the R. W. Hart Prizes for Excellence in Independent Research and Development have honored those who make signal contributions to science and technology through projects in basic and applied research and exploratory and advanced engineering. Departments recommend candidates, and the Management Forum judges the nominations on the quality and importance of the work to APL. Six departments nominated 11 projects for work completed in 2011; of these, one research project and one development project each won a prize. In addition, one research project received honorable mention.

The Editorial Board of the *Johns Hopkins APL Technical Digest* is responsible for selecting publications for awards on the basis of technical content, significance of scientific and engineering contributions, and literary

style. Established in 1985 to encourage professional publication, this competition is open to all technical staff. Departments may submit up to two nominations in each of six categories. In 2012, seven departments submitted 27 publications for the 2011 Publication Awards competition. Of these, the Editorial Board selected five publications from three departments for honors.

Unlike the annual awards, the Lifetime Achievement Award is presented only when an individual has produced an unusual assemblage of distinguished publications in science and engineering during a professional career at APL. Departments may nominate any number of candidates. The Editorial Board of the *Technical Digest* selects recipients on the basis of the award's unique criteria. Since 1986, this prestigious award has been bestowed on only 14 people. This year, APL honored Harry K. Charles Jr. with the Lifetime Achievement Publication Award.

The top two inventions were announced during the 13th annual Invention of the Year Award Reception on 23 April 2012. The awards for meritorious writing and prizes for outstanding independent research and development projects were celebrated at the Technical Achievement Award reception on 8 November 2012.

Exceptional scholarship and achievement in the sciences, engineering, and technology are critical components of APL's competitive strength. The recipients of these honors each carried out their work with the patient effort and dedication that led to their achievements. Each met the exacting standards of a highly intensive adjudication process. We honor these scientists and engineers for their exceptional work and for their contributions to scientific and technological knowledge. Their names, along with the titles of their publications, projects, and inventions, are displayed on the following pages.

INVENTION OF THE YEAR AWARD FOR 2011

For "Ultra-Compact Multitasking Motor Controller"

The small motor controller is a miniaturized computational engine developed for the Revolutionizing Prosthetics program's arm. The controller is paired with an equally small motor, and together they fit within the confines of each digit, providing feedback and ensuring precise, coordinated movement for the fingers, thumb, wrist components, and vibration sensors in the fingertips.

Harry A. Eaton, Principal Professional Staff, M.S., JHU, 1991, Electrical Engineering; **Douglas S. Wenstrand**, Principal Professional Staff, M.S., JHU, 1999, Electrical Engineering

GOVERNMENT PURPOSE INNOVATION AWARD FOR 2011

For "Constrained Probability of False Alarm Classification"

A large-margin classifier that directly maximizes true positive classifications at a desired false alarm rate by using an optimization constraint on the estimated probability of false alarms. Unlike existing false alarm constrained classifiers, the APL approach allows the use of an arbitrary loss function and is applicable to nonlinear datasets that exhibit a high degree of class imbalance.

Joshua B. Broadwater, Principal Professional Staff, Ph.D., Univ. of Maryland at College Park, 2007, Electrical Engineering; **Craig J. Carmen**, Senior Professional Staff, M.S., Washington Univ. in St. Louis, 2000, Biomedical Engineering; **Ashley J. Llorens**, Senior Professional Staff, M.S., Univ. of Illinois in Urbana-Champaign, 2003, Electrical Engineering

R. W. HART PRIZES FOR 2011

Excellence in Research

For “Capture and Control about Planetary Satellites and Asteroids Using Dynamical Systems Theory”

The NASA and National Research Council's Planetary Decadal Survey acknowledged that software is not sufficiently advanced to properly address mission designs about small, nonspherical bodies. The project developed software that now generates high-fidelity, end-to-end low-thrust, non-Keplerian trajectories about objects of any size within the solar system. This particular methodology is relatively new to the astrodynamics community.

Martin T. Ozimek, Senior Professional Staff, Ph.D., Purdue Univ., 2010, Aeronautics and Astronautics; **Christopher J. Scott**, Senior Professional Staff, Ph.D., Pennsylvania State Univ., 2010, Aerospace Engineering

Honorable Mention in Research

For “Flexible Readout and Integration Sensor (FRIS)”

The Flexible Readout and Integration Sensor (FRIS) independent research and development team successfully fabricated and tested multiple chips to demonstrate this innovative sensing concept, resulting in funding from a major sponsor with several other likely users. FRIS has progressed from concept to prototype to funded program. It is likely to be a game changer for key applications.

Charbel G. Rizk, Principal Professional Staff, Ph.D., Florida Atlantic Univ., 1997, Intelligent Controls; **Arnold C. Goldberg**, Senior Professional Staff, Ph.D., Univ. of Maryland at College Park, 1996, Physics; **Kim Strohbahn**, Principal Professional Staff, Ph.D., Iowa State Univ., 1979, Electrical Engineering; **Seppo J. Lehtonen**, Principal Professional Staff, B.S., Florida Atlantic Univ., 1985, Electrical Engineering; **Matiwos H. Kafel**, Associate Professional Staff, B.S., Old Dominion Univ., 2002, Electrical Engineering

Excellence in Development

For “Automated Passive Sonar Signal Processing; Development of Shallow Water Autonomous DCL Systems”

The Shallow Water Autonomous Detection, Classification, and Localization System project resulted in the development of a proof of concept incorporating efficient, robust methods for automated classification that are effectively influencing Navy decision makers. The developed proof of concept is also being employed as a prototype for both underwater and in-air unconventional littoral warfare projects.

G. Scott Peacock, Principal Professional Staff, M.S., Univ. of Utah, 1978, Statistics; **Derek C. Fulk**, Senior Professional Staff, B.S., Michigan State Univ., 1998, Electrical Engineering; **Kevin H. Gormally**, Senior Professional Staff, Ph.D., Univ. of Maryland, 2009, Marine, Estuarine, and Environmental Science; **Cory R. Lorenz** (non-APL staff); **David N. Barsic**, Senior Professional Staff, M.S., Univ. of Michigan, 2003, Electrical Engineering Systems; **Melissa A. Jones**, Senior Professional Staff, M.S., JHU, 2007, Computer Science; **Robert M. Patterson**, Senior Professional Staff, M.S., Ohio State Univ., 2002, Electrical Engineering; **William R. Gray**, Senior Professional Staff, Ph.D. candidate, JHU, Electrical Engineering

PUBLICATION AWARDS FOR 2011

Author's First Paper in a Peer-Reviewed Journal or Proceedings

For "Radioactive Elements on Mercury's Surface from MESSENGER: Implications for the Planet's Formation and Evolution," *Science* **333**(6051), 1850–1852 (2011).

This *Science* paper provides new information on the abundance of key radioactive elements in Mercury's northern hemisphere. These data show that internal heat production has declined substantially since Mercury's formation, providing exciting constraints on the formation mechanisms for Mercury, ruling out some pre-MESSENGER assumptions.

Patrick N. Peplowski, Senior Professional Staff, Ph.D., Florida State Univ., 2009, Experimental Nuclear Physics; co-authored with **Larry G. Evans** (non-APL staff), **Steven A. Hauck II** (non-APL staff), **Timothy J. McCoy** (non-APL staff), **William V. Boynton** (non-APL staff), **Jeffery J. Gillis-Davis** (non-APL staff), **Denton S. Ebel** (non-APL staff), **John O. Goldsten**, **David K. Hamara** (non-APL staff), **David J. Lawrence**, **Ralph L. McNutt Jr.**, **Larry R. Nittler** (non-APL staff), **Sean C. Solomon** (non-APL staff), **Edgar A. Rhodes**, **Ann L. Sprague** (non-APL staff), **Richard D. Starr** (non-APL staff), and **Karen R. Stockstill-Cahill** (non-APL staff)

Outstanding Paper in the *Johns Hopkins APL Technical Digest*

Walter G. Berl Award

For "Control System Architecture for the Modular Prosthetic Limb," *Johns Hopkins APL Technical Digest* **30**(3), 217–222 (2011).

Under the DARPA Revolutionizing Prosthetics program, APL and others developed an advanced, neurally controlled, prosthesis, restoring function and dexterity to soldiers with upper-arm amputations. These authors provided an overview of their cutting-edge work, describing how the flexibility of their novel control architecture design is able to support varying prosthetic control paradigms.

Michael M. Bridges, Principal Professional Staff, Ph.D., Clemson Univ., 1994, Electrical Engineering; **Matthew P. Para**, Senior Professional Staff, M.E., Univ. of Maryland, 2010, Mechanical Engineering; **Michael J. Mashner**, Senior Professional Staff, Ph.D. candidate, JHU, 2011, Mechanical Engineering

Outstanding Research Paper in an Externally Refereed Publication

For "Rapid and Extensive Surface Changes Near Titan's Equator: Evidence of April Showers," *Science* **331**(6023), 1414–1417 (2011).

This exciting *Science* paper showed the first evidence for low-latitude precipitation on Titan. The authors observed a storm and also detected post-storm surface changes. This work demonstrates that Titan has an active liquid cycle and that equatorial channels are currently active, not a result of ancient movement of liquid.

Elizabeth P. Turtle, Principal Professional Staff, Ph.D., Univ. of Arizona, 1998, Planetary Sciences; **Jason E. Perry** (non-APL staff); **Alex G. Hayes** (non-APL staff); **Ralph D. Lorenz**, Principal Professional Staff, Ph.D., Univ. of Kent, 1994, Space Sciences; **Jason W. Barnes** (non-APL staff); **Alfred S. McEwen** (non-APL staff); **Robert A. West** (non-APL staff); **Anthony D. Del Genio** (non-APL staff); **John M. Barbara** (non-APL staff); **Jonathan I. Lunine** (non-APL staff); **Emily L. Schaller** (non-APL staff); **Trina L. Ray** (non-APL staff); **Rosalyn M. C. Lopes** (non-APL staff); **Ellen R. Stofan** (non-APL staff)

Outstanding Development Paper in an Externally Refereed Publication

For "High-Sensitivity DPSK Receiver for High-Bandwidth Free-Space Optical Communication Links," *Optics Express* **19**(11), 10789–10796 (2011).

This paper describes the design and system results from a multiyear AFRL and DARPA effort to develop a high-data-rate, optical modem system for long-range, free-space optical communications links that achieved record dynamic range and near quantum-limited data transport sensitivity. DPSK, or differential phase shift keying, is a particular modulation.

Juan C. Juarez, Senior Professional Staff, Ph.D., Texas A&M Univ., 2005, Electrical Engineering; **David W. Young**, Principal Professional Staff, Ph.D., Univ. of Connecticut, 2003, Electrical Engineering; **Joseph E. Sluz**, Principal Professional Staff, M.S., JHU, 1995, Electrical Engineering; **Larry B. Stotts** (non-APL staff)

Outstanding Special Publication

For "On Optimizing Command and Control Structures," *Proceedings of the 16th International Command and Control Research and Technology Symposium* (2011).

A number of concepts from information theory are applied to the analysis of command and control (C2) to test the hypothesis that the information-theoretic characteristics of a C2 task are key in deriving optimal C2 structures. Simulations are used to demonstrate that information theoretic parameters determine the relative efficacies of different communication topologies.

David H. Scheidt, Principal Professional Staff, B.S., Case Western Reserve Univ., 1985, Computer Engineering; **Kevin M. Schultz**, Senior Professional Staff, Ph.D., Ohio State Univ., 2010, Electrical and Computer Engineering

Lifetime Achievement Publication Award

Presented to **Harry K. Charles Jr.**

This award is intended to honor the recipient author for a lifetime of achievement through a substantial body of publications that are considered significant by peer recognition, prizes, citation frequency, or influence on technical developments at APL or elsewhere. As such, it is not awarded every year.

Dr. Charles is an internationally recognized contributor to the world's body of technical literature, having published more than 200 articles and presentations in various fields including antiferromagnetism, solar cells, microelectronics, electronic materials, and bio-medical devices. His most significant contributions lie in the microelectronics arena, especially wire bonding and advanced soldered interconnect.