

## APL Achievement Awards and Prizes

*Linda L. Maier-Tyler*



*ew developments and discoveries in science, engineering, and technology are critical to responding to the new challenges facing our nation and to advancing APL's mission as a leader both in innovative solutions to national security problems and in space research and exploration. To encourage our scientists and engineers to bring fresh ideas and new energy to their research and development efforts, 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 (IR&D) projects, and out-of-the-box innovative thinking leading to the invention of new technologies that benefit society. The Publication Awards, the R. W. Hart Prizes honoring excellence in IR&D, and the Invention of the Year Awards are competitions that represent the Laboratory's best in writing, research, development, and technology, all particularly evident in the exemplary selection of winning publications, IR&D projects, and inventions for 2010.*

Professional publication in refereed journals is central to scientific communication and is the medium by which important results and innovations are promptly and accurately recorded and disseminated. To encourage APL staff members to publish in refereed journals and other specialized publications, the Editorial Board of the *Johns Hopkins APL Technical Digest* solicits nominations from each APL department for publications

considered to be outstanding and evaluates them according to stringent criteria. Publications must conform to professional standards and are judged on significance and clarity, with considerably greater weight given to the significance of the work in advancing science and engineering in support of the Laboratory's mission. In 2011, seven technical departments submitted 27 publications from those published in 2010. Of these, seven

publications from five categories of competition were selected for honors.

APL's strong commitment to innovative research and development is essential to its future success as a premier technical organization. The R. W. Hart Prizes serve both to signify the importance of the Independent Research and Development (IR&D) program to the long-term future of the Laboratory and to reward achievement in high-quality innovative projects. The competition was named for Robert W. Hart, former APL Assistant Director for Research and Exploratory Development, to recognize his many contributions to these activities. Two prizes are given, one for research and the other for development. APL department heads recommend candidates, and the Management Forum judges the nominations on the quality and importance of the work to APL. Ten projects were nominated for work completed in 2010; of these, one research project and one development project each won a prize. In addition, two development projects received honorable mention.

Generating fresh solutions to problems and having the ability to create new products, processes, or services for a changing market and new world are among the vital resources that give an organization its competitive edge. The Invention of the Year Awards program encourages new technology and innovation at APL and identifies the top technology from the preceding year. This year, 282 APL researchers disclosed 155 inventions for the 2010 competition. 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. New this year is a Government Purpose Innovation Award, which recognizes inventions that impact a critical challenge faced by the Laboratory's sponsors. Of the 155 inventions, two were considered outstanding and won awards.

The top two inventions were announced during the 12th annual Invention of the Year Award reception held 10 May 2011. The awards for meritorious writing and prizes for outstanding IR&D projects were formally announced at the Principal Professional Staff Dinner on 17 November 2011. The APL achievement awards and prizes represent the outstanding work done by APL staff. The recipients are among the Laboratory's best and brightest—they perceive the world in new ways, they find hidden patterns, they make connections between seemingly unrelated phenomena, and they ask the important questions that generate solutions. All have displayed ingenuity, dedication, and a relentless commitment to excellence, critical components of APL's missions in national security and space. Their names and photographs are displayed on the following pages, along with the titles of their publications, projects, and inventions.

## PUBLICATION AWARDS FOR 2010

### Author's First Paper in a Peer-Reviewed Journal



Jason J. Benkoski

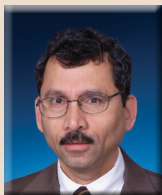
For "Dipolar Assembly of Ferromagnetic Nanoparticles into Magnetically Driven Artificial Cilia," *Soft Matter* **6**, 602–609 (2010).

The authors report a method for fabricating nanomechanical actuators by using a self-assembly technique. With little more than a strategically placed permanent magnet, 25-nm cobalt nanoparticles self-assemble into dense brushes of 25-nm  $\times$  15- $\mu$ m filaments that flex like biological cilia. Applications for this technology include microrobotics, acoustic sensing, microfluidics, and more.

**Jason J. Benkoski**, Senior Professional Staff, M.S./Ph.D., Univ. of California, Santa Barbara, 2003, Materials Science; coauthored with **Ryan M. Deacon**, **H. Bruce Land**, **Lance M. Baird**, **Jennifer L. Breidenich** (non-APL staff), **Rengaswamy Srinivasan**, **Guy V. Clatterbaugh**, **Pei Yuin Keng** (non-APL staff), and **Jeffrey Pyun** (non-APL staff)

### Outstanding Paper in the *Johns Hopkins APL Technical Digest*

#### Walter G. Berl Award



Rengaswamy  
Srinivasan



Paul J. Biermann

For "Embeddable Batteries: Taking Shape," *Johns Hopkins APL Technical Digest* **28**(4), 364–372 (2010).

Commercial electronics devices have space for the battery whose dimensions are dictated by the size of the COTS cells. This paper describes the innovative technology of designing conformal batteries at APL. These innovative batteries are designed to conform to the shape of electronic devices designed for special missions.

**Rengaswamy Srinivasan**, Senior Professional Staff, Postdoctoral Fellow, Georgetown Univ., 1983–1987, Ph.D., Indian Inst. of Science, 1978, Chemistry; **Paul J. Biermann**, Principal Professional Staff, B.S., Rensselaer Polytechnic Inst., 1980, Materials Engineering; **Jeffrey P. Maranchi**, Senior Professional Staff, Ph.D., Carnegie Mellon Univ., 2004, Materials Science and Engineering; **Terry E. Phillips**, Principal Professional Staff, Ph.D., JHU, 1976, Organic Chemistry



Jeffrey P.  
Maranchi



Terry E. Phillips

## Outstanding Research Paper in an Externally Refereed Publication (Tie)



Rick D. Chapman



Chad M. Hawes



Michael E. Nord

For “Target Motion Ambiguities in Single-Aperture Synthetic Aperture Radar,” *IEEE Transactions on Aerospace and Electronic Systems* **46**(1), 459–468 (2010).

The authors prove that, for the case of a single-aperture synthetic aperture radar in linear flight, there exist moving target trajectories that are indistinguishable from stationary scatterers. For circular and orbital flight paths, however,

one can infer both velocity components given sufficient angular diversity, a result that is significant to the intelligence community.

**Rick D. Chapman**, Principal Professional Staff, Ph.D., Florida State Univ., 1987, Physical Oceanography; **Chad M. Hawes**, Principal Professional Staff, M.S., Drexel Univ., 1996, Electrical Engineering; **Michael E. Nord**, Senior Professional Staff, Ph.D., Univ. of New Mexico, 2005, Physics



Andrew S. Rivkin

For “Detection of Ice and Organics on an Asteroidal Surface,” *Nature* **464**(7293), 1322–1323 (2010).

This work reports on the spectroscopic detection of water ice and organic material on the asteroid 24 Themis. The authors found that water ice is more common on asteroids than was previously thought and may be widespread in asteroidal interiors at much smaller heliocentric distances.

**Andrew S. Rivkin**, Senior Professional Staff, Ph.D., Univ. of Arizona, 1997, Planetary Astronomy; **Joshua P. Emery** (non-APL staff)

## Outstanding Development Paper in an Externally Refereed Publication (Tie)



Ibolja Cernak

For “The Importance of Systemic Response in the Pathobiology of Blast-Induced Neurotrauma,” *Frontiers in Neurology* **1**(Dec 10), 1–9 (2010).

This paper reports on extremely important research in designing effective personal protective equipment for warfighters. Dr. Cernak’s work showed that head protection failed to prevent inflammation in the brain or to reduce neurological deficits, whereas body protection was successful in alleviating blast-induced functional and morphological impairments in the brain.

**Ibolja Cernak**, Principal Professional Staff, Ph.D., Military Medical Academy and Univ. of Belgrade, 1990, Pathophysiology/Neuroscience



Thomas R. Clark Jr.



Sean R. O’Connor



Michael L. Dennis

For “A Phase-Modulation I/Q-Demodulation Microwave-to-Digital Photonic Link,” *IEEE Transactions on Microwave Theory and Techniques* **58**(11), 3039–3058 (2010).

This paper describes the detailed design and system test bed results from a multiyear DARPA effort to develop an innovative photonic transport and digital receiver technique for analog RF signals. Possible applications for this

technology include advanced radar, communications, and electronic warfare problems.

**Thomas R. Clark Jr.**, Principal Professional Staff, B.S., Virginia Polytechnic Inst. and State Univ., 2004, Business Information Technology: E-Commerce; **Sean R. O’Connor**, Associate Professional Staff, B.S.E.E., Drexel Univ., 2007, RF Electronics; **Michael L. Dennis**, Principal Professional Staff, Ph.D., Univ. of New Mexico, 1991, Optical Sciences

## Outstanding Special Publication



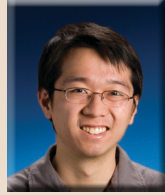
Philippe M.  
Burlina



Chad R. Sprouse



Daniel F.  
DeMenthon



Radford R. Juang

For "Patient-Specific Modeling and Analysis of the Mitral Valve Using 3D-TEE," *Proceedings of the International Conference on Information Processing for Computer Assisted Surgical Intervention, Lecture Notes in Computer Science (LNCS), Vol. 6135, pp. 135–146 (2010).*

This paper describes a system for personalized surgical planning, leveraging 3D image analysis and physics-based modeling methods to assess the functionality of the patient's mitral valve. The valve's 3D structure is obtained from segmentation of 3D ultrasound imagery and modified through "virtual" surgery. The system is a preoperative planning tool to aid surgeons in choosing from among various potential mitral valve repair options available.

**Philippe M. Burlina**, Principal Professional Staff, Ph.D., Univ. of Maryland, 1994, Communications and Control, Electrical Engineering; **Chad R. Sprouse**, Senior Professional Staff, M.S., JHU, 2002, Computer Science; **Daniel F. DeMenthon**, Senior Professional Staff, Ph.D., Université Joseph Fourier, Grenoble, 1993, Computer Science; **Anne Jorstad** (non-APL staff); **Radford R. Juang**, Senior Professional Staff, M.S., Univ. of California, Irvine, 2007, Electrical and Computer Engineering; **Francisco Contijoch** (non-APL staff); **Theodore Abraham** (non-APL staff); **David Yuh** (non-APL staff); **Elliot McVeigh** (non-APL staff)

## R. W. HART PRIZES FOR 2010

### Excellence in Research



Shown left to right: I. K. Ashok Sivakumar, Keith J. Rebello, Plamen A. Demirev, Jeffrey S. Lin, Thomas S. Mehoke, Ariel M. Greenberg, Nathan A. Hagan, and Andrew B. Feldman. (Not pictured: Mekbib Astatke, Sean P. Murphy, and Charles C. Young.)

#### For “Applied DNA Sequencing Initiative”

This project’s goal was to collaborate with The Johns Hopkins University (JHU) and leverage and reposition emerging commercial technologies that were developed to rapidly sequence the human genome toward JHU/APL sponsor applications in biodefense, disease surveillance, and human forensic identification in complex multicontributor samples. Unique bioinformatics and analytical approaches were developed to resolve major and minor constituents in samples for microbial and human population genetics through an understanding, characterization, and mitigation of sequencing errors. These tools have enabled new initiatives for the Office of Naval Research, Department of Homeland Security, and Defense Advanced Research Projects Agency.

**Andrew B. Feldman**, Principal Professional Staff, Ph.D., Harvard Univ., 1997, Physics, Mass Spectrometry, Bioinformatics, Cardiac Electrophysiology, Physics and Computer Science; **Jeffrey S. Lin**, Principal Professional Staff, M.S., The Johns Hopkins Univ., 1989, Computer Science, Planning and Execution of SS Sonar System Tests; **Plamen A. Demirev**, Principal Professional Staff, Docent in Ion Physics (Habilitation), Uppsala Univ., 1995, Ph.D., Bulgarian Academy of Sciences, 1988, Chemistry, Mass Spectrometry, and Its Applications, Including Proteomics; **Ariel M. Greenberg**, Associate Professional Staff, B.S., Univ. of Maryland, 2003, Electrical Engineering and Biological Sciences, Modeling, Simulation, and Analysis in Air Defense, Bioinformatics, and Cognitive Systems; **Sean P. Murphy**, Senior Professional Staff, M.B.A., Oxford Univ., Saïd Business School, 2008, Development of Novel Computational Algorithms; **Keith J. Rebello**, Senior Professional Staff, M.S., The Johns Hopkins Univ., 2008, Applied Biomedical Engineering, Design, Fabrication, Programming, and Project Management; **Thomas S. Mehoke**, Associate Professional Staff, B.S., Duke Univ., Biology, Bioinformatics and Designing and Conducting Biological Experiments and Analysis; **I. K. Ashok Sivakumar**, Senior Professional Staff, M.S., Massachusetts Inst. of Technology, 2002, Electrical Engineering and Computer Science, Technological Innovation, Leveraging Experience in Global Defense and Energy Sectors; **Charles C. Young**, Principal Professional Staff, Ph.D., Pennsylvania State Univ., 1991, Molecular and Cell Biology, Medical and Environmental Diagnostic Industry; **Nathan A. Hagan**, Senior Professional Staff, Ph.D., Univ. of Maryland, 2006, Chemistry, Bioanalytical Chemistry; **Mekbib Astatke**, Senior Professional Staff, Ph.D., Univ. of Nebraska–Lincoln, 1992, Protein Biochemistry, Molecular Biological and Biophysical Chemistry Techniques

## Excellence in Development



Shown left to right: Steven A. Kahn, Julie L. Farmer, Kathryn E. Mackey, Adam J. Miller, Margaret A. McGarry, Richard L. Bourgeois, William G. Bath, Carlos E. Alfonso, and Russell W. Garrett. (Not pictured: Ana Leticia F. Bento, Carol A. Nolf, and John H. Zouck.)

### For “Componentized Analysis Framework of Next-Generation Combat Systems Components”

This independent research and development project was originally directed at developing a framework to evaluate future combat systems. However, in early FY2010, it was refocused on serious Navy operational interoperability problems, thereby giving the Navy, for the first time, an analytical tool to analyze and solve serious interoperability problems. This effort led to Navy development of an interoperability solution slated for rapid and wide deployment in the Fleet.

**Carlos E. Alfonso**, Senior Professional Staff, M.S., Rochester Inst. of Technology, 2006, Computer Science, Software Development, Combat Systems; **William G. Bath**, Principal Professional Staff, Ph.D., The Johns Hopkins Univ., 1980, Electrical Engineering, Sensor Integration and Automation, Radar Systems Tracking, Filtering and Statistical Estimation; **Ana Leticia F. Bento**, Associate Professional Staff, M.S., Carnegie Mellon Univ., 2006, Information Security Technology Management, Information Assurance, Computer Systems Infrastructure, Mathematics; **Richard L. Bourgeois**, Principal Professional Staff, M.S., The Johns Hopkins Univ., 1997, Electrical Engineering, Networked Multi-Sensor System Tracking System Design, Analysis and Modeling for Navy Combat Systems; **Julie L. Farmer**, Senior Professional Staff, M.S., The Johns Hopkins Univ., 2010, Computer Science; **Russell W. Garrett**, Senior Professional Staff, B.S., Univ. of Maryland, 1979, Computer Science, Design and Development of Imagery and Navy Shipboard Software; **Steven A. Kahn**, Principal Professional Staff, M.S., The Johns Hopkins Univ., 1984, Computer Science, Computer Networking and Communications; **Kathryn E. Mackey**, Associate Professional Staff, B.S., Univ. of Maryland, 2011, Computer Engineering; **Margaret A. McGarry**, Senior Professional Staff, B.S., Univ. of Maryland Univ. College, 1987, Computer Science, Software Design; **Adam J. Miller**, Senior Professional Staff, M.S., The Johns Hopkins Univ., 2002, Electrical and Computer Engineering, Software and Systems Engineering; **Carol A. Nolf**, Senior Professional Staff, B.S., Univ. of Maryland Univ. College, 2000, Computer and Information Science, Design, Development, and Integration; **John H. Zouck**, Principal Professional Staff, M.S., The Johns Hopkins Univ., 1976, Computer Science, Real-Time Computer Systems Hardware and Software Development

## INVENTION OF THE YEAR AWARD FOR 2010



Jason J. Benkoski



Hala J. Tomey



George L. Coles Jr.



Morgana M.  
Trexler



Robert C.  
Matteson III

### For “Implantable Pressure-Actuated Drug-Delivery Systems and Methods”

To prevent arterial clots, including those caused by the stent treatment itself, a stent is enhanced with a pressure-sensitive microchip and drug-filled diaphragm, enabling drug release upon changes in blood pressure.

**Jason J. Benkoski**, Senior Professional Staff, M.S./Ph.D., Univ. of California, Santa Barbara, 2003, Materials Science; **Hala J. Tomey**, Senior Professional Staff, M.S., Univ. of Maryland, 1997, Mechanical Engineering; **George L. Coles Jr.**, Senior Professional Staff, M.S., JHU, 2001, Biomedical Engineering; **Morgana M. Trexler**, Senior Professional Staff, Ph.D., Georgia Inst. of Technology, 2008, Materials Science and Engineering; **Robert C. Matteson III**, Associate Professional Staff, B.S.E., Univ. of Maryland, 2002, Mechanical Engineering; **Chao-Wei Hwang** (non-APL staff); **Jon Resar** (non-APL staff)

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## GOVERNMENT PURPOSE INNOVATION AWARD FOR 2010



John M. Klimek

### For “Naturally Occurring Indigenous Sound Emulation (NOISE)”

Encoded bioacoustic communication methods are used to modify sounds produced by animals and insects native to a specific area, enabling the creation of a covert, ad hoc communication network for recording and reporting complex data on activity and terrain.

**John M. Klimek**, Senior Professional Staff, B.S., Univ. of Wyoming, 1988, Electrical Engineering