The Johns Hopkins University Applied Physics Laboratory (APL) has a long tradition of granting awards and prizes in recognition of APL staff members and their contributions. APL’s Achievement Awards and Prizes, presented annually during a ceremony open to all staff members, are a true celebration of innovation and an opportunity to recognize, honor, and encourage scientific and technical excellence. This year’s program honored the Laboratory’s top inventions, publications, and independent research and development projects, as well as other esteemed accomplishments.

On 19 April 2016, Johns Hopkins University Applied Physics Laboratory (APL) management and staff gathered to celebrate the Laboratory’s top inventions, innovations, accomplishments, and publications from 2015. Before the award presentations, attendees browsed “Creative Collaboration” displays highlighting various APL programs. Inventors and project leaders were on hand to answer questions and share stories about their developments, some of which were on display to the public for the first time.

Among the most prestigious awards presented during the ceremony was the Invention of the Year Award, which was established in 2000 to encourage new technology and innovation at APL. To identify the top technology from the preceding year, invention disclosures are judged by an independent review panel of technical and business consultants, technology transfer professionals, and intellectual property attorneys. The judges assess nominated inventions’ creativity, novelty, improvement to existing technology, commercial potential, and probable benefit to society. This year’s winning invention is a cost-effective, multifunctional water purification membrane that can simultaneously remove pathogens and toxic heavy metals, such as lead, arsenic, mercury, and cadmium.

The Government Purpose Innovation Award was established in 2011 to recognize inventions that have the potential to make significant impact in the defense community and for the nation. This year’s winner is an advanced RF jamming prototype.

Although the Alvin R. Eaton Award has been quietly presented for many years, this year APL publicly conferred the award for the first time. Named in honor of the late aerodynamics pioneer whose designs formed the basis for modern guided missile weapon systems, this award recognizes Laboratory staff members who have made transformative innovations to national security in areas and programs in which the U.S. government has placed exceptionally restrictive security measures. This year’s awardee was recognized for his sustained performance and exceptional scientific and engineering innovations that have directly contributed to the security of our nation.

These accomplishments are testaments to APL’s foundation of innovative and creative thinking and ability to translate ideas into effective technical solutions. Over the past several years, the Laboratory has focused on further enhancing its culture of innovation through a series of coordinated enterprise-level initiatives.
The Ignition Grants program encourages APL staff to explore innovative ideas that are outside of the organization's traditional programs and processes. Open to all staff, challenges are posted during several cycles throughout the year, and staff members submit ideas for solutions. Submissions are judged by staff members, and finalists receive funding to further develop their ideas. The Ignition Grant Award for Technical Innovation recognizes the top project funded through the Ignition Grants program. This year the award was presented to a staff member who collaborated on the design of an innovative one-piece suit that protects healthcare workers from the spread of deadly infectious diseases.

Like those working on projects funded by Ignition Grants, staff members focused on sponsored programs are also innovating and making critical contributions to solving the nation's challenges. The Outstanding Mission Accomplishment Awards recognize major achievements in mission-oriented programs and projects. Awards are given in two categories: a current challenge and an emerging challenge. For both types of awards, a review team of top managers and executives from APL's sectors and mission areas solicits nominations for technical accomplishments achieved in sponsored programs during the previous year. Entries are judged on technical excellence and potential impact.

Now in its second year, the Enterprise Accomplishment Award recognizes initiatives with the greatest impact on APL's operations and culture of innovation. This year's winners were recognized for building a cadre of staff members with the ability to employ design thinking methodologies to help find innovative and creative solutions to some of APL's most daunting technical and organizational tasks. Design thinking is a solution-based, multiple-method approach for creating a better future state rather than fixing a single problem. Since its creation two years ago, APL's innovation center, Central Spark, has hosted numerous design thinking sessions and provided staff members with tools and resources for discovering design thinking methodologies.

Oftentimes, independent research and development yields promising results that can be applied to meeting the most pressing needs of the Lab's sponsors and the nation. The R. W. Hart Prize for Excellence in Independent Research and Development—established in 1989 in honor of former APL Assistant Director for Research and Exploratory Development Robert W. Hart—recognizes significant contributions that advance science and technology through independent research and development. Sectors and departments recommend candidates, and the Management Forum judges the nominations on the quality and importance of the work to APL. Prizes are awarded in two categories: best research project and best development project. From those projects active in 2015, one prize was awarded in each category.

Professional publication is the medium through which the Lab's important results and innovations are shared with others. To encourage and reward exceptional scholarship, the Editorial Board of the Johns Hopkins APL Technical Digest established the Publication Awards competition in 1985 both to promote professional writing and to recognize outstanding publications by the APL professional staff. Departments and sectors may submit up to two nominations in each of six categories. Judges base their selections on significance and clarity, with considerably greater weight given to the significance of the work in advancing science, engineering, or the mission of the Laboratory. Of the publications submitted for consideration, six won honors.

New developments and discoveries in science, engineering, and technology are critical in meeting the complex challenges of today's society and anticipating the tools needed to solve the challenges of the future. The work of these outstanding individuals not only represents APL's best but also demonstrates the Lab's capacity to meet these evolving challenges. Award winners' names, along with titles and brief descriptions of their inventions, projects, accomplishments, and publications, are displayed on the following pages.
INVENTION OF THE YEAR AWARD FOR 2015

For “Novel Water Filtration Membranes”

Access to safe drinking water is a critical issue affecting people worldwide. Xia and Ward have developed a cost-effective, multifunctional water purification membrane that can simultaneously remove pathogens and toxic heavy metals, such as lead, arsenic, mercury, and cadmium. The membrane can be retrofitted into existing filtration systems, and its antifouling capabilities ensure effectiveness and greatly extend replacement cycles beyond what is currently available.

Zhiyong Xia, Senior Professional Staff, Research and Exploratory Development Department, Ph.D., Mechanical Engineering, Texas A&M University; Brad M. Ward, Principal Professional Staff, Asymmetric Operations Sector, M.S., Strategy, U.S. Army War College

GOVERNMENT PURPOSE INNOVATION AWARD FOR 2015

For “Advanced RF Jamming Techniques”

Traditional jamming techniques are commonly used for generating only simple stationary false targets. Magnani and Song have developed an advanced RF jamming prototype using sophisticated techniques. These techniques have the potential to significantly enhance RF jamming effectiveness in complex environments.

Timothy P. Magnani, Principal Professional Staff, Force Projection Sector (FPS), M.S., Electrical Engineering, Catholic University of America; Jay H. Song, Senior Professional Staff, FPS, M.S., Electrical Engineering, Johns Hopkins University
THE ALVIN R. EATON AWARD FOR 2015

For “Sustained Performance and Exceptional Scientific or Engineering Innovations That Have Directly Contributed to the Security of Our Nation”

For over a decade, Radcliffe has made profound contributions to national security through the development of novel RF sensing and geo-location systems and through the innovation of communication systems. These contributions have provided the U.S. government with transformative capabilities that have been employed with noteworthy results and commended by the highest levels of the government.

Scott T. Radcliffe, Principal Professional Staff, Asymmetric Operations Sector, M.S., Electrical Engineering, Johns Hopkins University

IGNITION GRANT AWARD FOR TECHNICAL INNOVATION FOR 2015

For “Improved Personal Protective Equipment for Ebola Healthcare Workers”

The design of an innovative one-piece personal protective suit protecting against the spread of deadly infectious diseases was a collaborative effort between Johns Hopkins University divisions and APL. USAID selected the Johns Hopkins prototype garment, made of an advanced DuPont material, to receive funding to address the healthcare challenge posed by Ebola.

Jason O. Johnson, Associate Professional Staff, Human Resources and Services Department, Ed.M., Curriculum/Instruction, Concordia University

Scott Radcliffe, winner of the 2015 Alvin R. Eaton Award.

Jason Johnson, winner of the 2015 Ignition Grant Award for Technical Innovation.
OUTSTANDING MISSION ACCOMPLISHMENT AWARDS FOR 2015

Current Challenge

For “The New Horizons Mission”

New Horizons’ encounter of Pluto was a resounding success both technically and from a public relations standpoint, and it was an inspiration for future scientists and engineers. The spacecraft continues to send back data from that July 14 encounter and is traveling farther onward into the Kuiper Belt for its next encounter. The core engineering team and its mission design are the fundamental achievements that lie at the core of the scientific and public success enjoyed by the larger team. For over a decade, APL’s core New Horizons team has executed this highly effective mission at the proposed cost and schedule and has met or exceeded all expectations.

Awarded to the New Horizons Core Mission Team: Peter Bedini, Principal Professional Staff, Space Exploration Sector (SES), M.S., Physics, University of Maryland, College Park; Kerri B. Beisser, Senior Professional Staff, SES, M.S., Aeronautical Science, Embry-Riddle Aeronautical University; Michael R. Buckley, Senior Professional Staff, Central Laboratory, B.A., Journalism, University of Maryland, College Park; Alice F. Bowman, Principal Professional Staff, SES, B.A., Physics, University of Virginia; Andrew Calloway, Principal Professional Staff, SES, B.A., Aerospace Engineering, Georgia Institute of Technology; Christopher B. Hersman, Principal Professional Staff, SES, M.S., Electronic Engineering, Ohio State University; Mark E. Holdridge, Principal Professional Staff, SES, M.S., Astronautics, George Washington University; Valerie A. Mallder, Principal Professional Staff, SES, M.S., Technical Management, Johns Hopkins University; Gabe D. Rogers, Principal Professional Staff, SES, M.S., Aeronautical Engineering, University of Illinois; Harold A. Weaver Jr., Principal Professional Staff, SES, Ph.D., Physics, Johns Hopkins University.

Pictured from left to right: Christopher Hersman, Alice Bowman, Peter Bedini, Gabe Rogers, Michael Buckley, Andrew Calloway, and Mark Holdridge, winners of the 2015 Outstanding Mission Accomplishment Award for a Current Challenge. Awardees not pictured: Kerri Beisser, Valerie Mallder, and Harold Weaver Jr.
OUTSTANDING MISSION ACCOMPLISHMENT AWARDS FOR 2015

Emerging Challenge

For “Time-Critical Target Defeat”

This project, supported by every APL sector and department, involved analyzing, developing, and testing new operating concepts and novel capabilities to defeat time-critical targets. The project is impacting DoD’s programmatic investments, its mission planning, and its upcoming exercises and tests to develop, assess, and field new approaches to defeat these threats.

Preston C. Dunlap, Senior Professional Staff, National Security Analysis Department, M.S., Operations Research and Management Science, George Mason University; Ashley J. Llorens, Senior Professional Staff, M.S., Electrical Engineering, University of Illinois in Urbana–Champaign; Thomas M. Falk, Senior Professional Staff, Air and Missile Defense Sector, M.B.A., Management, Golden Gate University; Ed Vince Doran, Senior Professional Staff, Force Projection Sector; Jeremy P. Sotzen, Associate Professional Staff, Space Exploration Sector, M.S., Applied Physics, Johns Hopkins University

Pictured from left to right: Preston Dunlap, Jeremy Sotzen, and Thomas Falk, winners of the 2015 Outstanding Mission Accomplishment Award for an Emerging Challenge. Awardees not pictured: Ashley Llorens and Ed Doran.
ENTERPRISE ACCOMPLISHMENT AWARD FOR 2015

For “The Design Thinking Corps: Embedding Design Thinking Throughout the Organization”

By embedding design thinking throughout the organization, the corps has significantly impacted the enterprise by building a cadre of staff members with the ability to employ design thinking methodologies to help find innovative and creative solutions to some of APL’s most daunting technical and organizational tasks.

Thomas A. Heffner, Senior Professional Staff, Force Projection Sector (FPS), M.S., Psychology, University of Pennsylvania; Dennis O. Smith, Senior Professional Staff, Information Technology Services Department, Ed.M., Personnel, Kent State University; David L. Nobles, Senior Professional Staff, FPS, M.B.A., Business Administration, Penn State University; Joshua D. Smith, Senior Professional Staff, FPS, M.S., Engineering Management, Old Dominion University; Donald A. Noyes, Senior Professional Staff, FPS, Master Chief Petty Officer/Acoustic Intelligence Specialist, U.S. Navy (retired)

Pictured from left to right: Donald Noyes, Joshua Smith, Dennis Smith, and David Nobles, winners of the 2015 Enterprise Accomplishment Award. Awardee not pictured: Thomas Heffner.
R. W. HART PRIZES FOR 2015

Best Research Project

For “Neurally Integrated Computing”

The team developed the first phase of a completely new capability in brain–computer interfaces: the ability to read out conceptual thought from electrophysiological signals at high fidelity.

Principal leaders Mark A. Chevillet, Senior Professional Staff, Research and Exploratory Development Department (REDD), Ph.D., Neuroscience, Georgetown University; Michael E. Wolmetz, Senior Professional Staff, REDD, Ph.D., Cognitive Science, Johns Hopkins University; Matthew J. Roos, Senior Professional Staff, REDD, Ph.D., Neuroscience, Johns Hopkins School of Medicine; Christopher R. Ratto, Senior Professional Staff, Force Projection Sector (FPS), Ph.D., Electrical and Computer Engineering, Duke University; Carlos A. Caceres Garcia, Associate Professional Staff, FPS, M.S., Mechanical Engineering, Virginia Polytechnic Institute and State University

Pictured from left to right: Michael Wolmetz, Matthew Roos, and Christopher Ratto, winners of the 2015 R. W. Hart Prize for Best Research Project. Awardees not pictured: Mark Chevillet and Carlos Caceres Garcia.
**Best Development Project**

For “Enhanced Weapons of Mass Destruction Analytics”

This project solved a critical in-theater challenge—a solution that has been elusive to the broader counter-weapons-of-mass-destruction community. The team applied unsupervised learning techniques to unlabeled data to find secondary signatures of activities in case primary signals were unavailable. The results were confirmed on labeled, classified data.

Primary contributor Aaron T. Katz, Principal Professional Staff, Asymmetric Operations Sector, M.S., Computer Science, Johns Hopkins University

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**PUBLICATION AWARDS FOR 2015**

**Author’s First Paper in a Journal or Proceedings**


The paper describes the first fully automated images-to-graphs pipeline for electron microscopy connectomics. This pipeline starts with an imaged volume of neural tissue and produces a brain graph without human interaction. To evaluate performance, a metric was developed to assess output graph quality and the framework was demonstrated on a large public data set.

William R. Gray Roncal, Senior Professional Staff, Research & Exploratory Development Department (REDD), M.S., Electrical Engineering, University of Southern California; Dean M. Kleissas, Senior Professional Staff, REDD, M.S., Mechanical Engineering, Johns Hopkins University

Pictured from left to right: Dean Kleissas and William Gray Roncal, winners of the 2015 Publication Award for Author’s First Paper in a Journal or Proceedings.
Outstanding Paper in the Johns Hopkins APL Technical Digest

The Walter G. Berl Award


This paper describes dynamics of the prospective TiME lander in response to waves while it floats in a hydrocarbon sea of Saturn’s moon Titan. This first evaluation of extraterrestrial seakeeping required development of models of the sea fluid properties, wind, and waves, and adaptation of commercial simulation tools to Titan.

Ralph D. Lorenz, Principal Professional Staff, Space Exploration Sector, Ph.D., Physics, University of Kent; Jennifer L. Mann, Senior Professional Staff, Force Projection Sector, M.S., Ocean Engineering, Massachusetts Institute of Technology

Outstanding Research Paper in an Externally Refereed Publication


Laboratory experiments have investigated the significant transfer of energy associated with a body moving through a stratified fluid (up to 70% of that available) to the internal wavefield. These results provide a baseline for ongoing numerical simulations and full-scale experimental efforts and have significant implications for undersea warfare studies.

Alan Brandt, Principal Professional Staff, Force Projection Sector (FPS), Ph.D., Civil Engineering, Carnegie Mellon University; John R. Rottier, Principal Professional Staff, FPS, M.S., Numerical Science, Johns Hopkins University

Pictured from left to right: John Rottier and Alan Brandt, winners of the 2015 Publication Award for Outstanding Research Paper in an Externally Refereed Publication.
Outstanding Development Paper in an Externally Refereed Publication


Definition of interplanetary dust particle hypervelocity impact protection levels provided by spacecraft MLI thermal blankets is provided for the first time. Development of a hydrocode computation-derived ballistic limit equation in the 7–150 km/s impact range for two wall shields, in which MLI is the bumper material, is presented.

Kaushik A. Iyer, Senior Professional Staff, Space Exploration Sector (SES), Ph.D., Materials Science and Engineering, Vanderbilt University; Douglas S. Mehoke, Principal Professional Staff, SES, M.S., Mechanical Engineering, Stanford University

Outstanding Professional Book


This publication presents the design drivers for the latest version of the Trusted Platform Module (TPM) technical specification and provides detailed insights regarding TPM 2.0 functionality as well as the application of this cutting-edge technology to address critical enterprise security challenges.

David C. Challener, Principal Professional Staff, Asymmetric Operations Sector, Ph.D., Mathematics, University of Illinois at Urbana–Champaign
Outstanding Special Publication


The legal status of U.S. military members acting in support of foreign resistance movements, or assisting host nation forces to quell internal resistance movements, varies with a movement's international legal status. The authors developed an analytic construct that provides understanding of this status, and associated legal protections, throughout such operations.

Erin N. Hahn, Senior Professional Staff, National Security Analysis Department (NSAD), J.D., Law, University of Maryland School of Law; W. Sam Lauber, Associate Professional Staff, NSAD, J.D., Law, University of Maryland School of Law

Pictured from left to right: Erin Hahn and W. Sam Lauber, winners of the 2015 Publication Award for Outstanding Special Publication.