# APL Achievement Awards and Prizes: The Lab's Top Inventions, Discoveries, and Technical Accomplishments in 2018

*APL Staff Writers*

## ABSTRACT

*Every year, the Johns Hopkins University Applied Physics Laboratory (APL) honors the accomplishments of its staff members with an awards program. When the program was created more than three decades ago, it recognized staff members' exceptional contributions to the scientific community via publication, and these publication awards are still presented today. Much like the Lab has evolved, its awards program has grown to include prizes recognizing extraordinary achievements in research and development and sponsored programs and, most recently, efforts that exemplify APL's focus on transformative innovations. Awards are presented during a formal ceremony on APL's campus in Laurel, Maryland. This article details the awards presented for achievements in 2018.*

## INTRODUCTION

With a theme of "Enabling Innovation by Enabling You," APL honored the best 2018 publications, research and development programs, innovation initiatives, mission and enterprise accomplishments, and more during its annual Achievement Awards ceremony on April 30, 2019. In all, 549 APL staff members were nominated in 118 entries for 23 awards, and a record 123 staff members were recognized for their successes. Those award winners represent a small portion of the critical contributions APL made for the nation in 2018, and highlight a few outstanding examples of the Lab's focus on collaboration, world-class expertise, and game-changing impact. "Thanks to all of our innovative staff members," Jerry Krill, APL's assistant director for science and technology, said at the ceremony. "They are dedicated to making critical contributions and creating defining innovations to ensure our nation's preeminence in the 21st century."

## AWARDS FOR INVENTION IN 2018

### Invention of the Year

The Invention of the Year Award was first presented in 2000 to encourage new technology and innovation at APL. To identify the top technology from the preceding year, an independent review panel judges invention disclosures. The judges, including technical and business consultants, technology transfer professionals, and intellectual property attorneys, assess inventions' creativity, novelty, improvement to existing technology, commercial potential, and probable benefit to society.

The winners of the Invention of the Year Award for 2018 were David W. Blodgett, Matthew S. Fifer, Scott M. Hendrickson, Alice F. Jackson, Erik C. Johnson, Tomek M. Kott, Clare W. Lau, Griffin W. Milsap, Jeremiah J. Wathen, and Michael E. Wolmetz. The team created a new optical system that noninvasively extracts

**Invention of the Year Award:** From left to right are Matthew S. Fifer, Jeremiah J. Wathen, Griffin W. Milsap, Michael E. Wolmetz, and David W. Blodgett. Not pictured are Scott M. Hendrickson, Alice F. Jackson, Erik C. Johnson, Tomek M. Kott, and Clare W. Lau.

anatomical and functional information from biological systems, including the brain. Originally developed for undersea operations, the optical system provides real-time access to magnitude and phase information about the brain, advancing understanding of structure and function; producing clinical insights into injury and disease diagnoses, prognoses, and treatment; and facilitating brain–computer interface applications.

### Government Purpose Innovation Award

The first Government Purpose Innovation Award, recognizing an invention that meets a critical sponsor need, was presented in 2011. Selected by a team of technical leaders from across the Lab who are acquainted with APL's technology transfer practices, finalist inventions are judged on their novelty and potential impact to the sponsor community.

**Government Purpose Innovation Award:** From left to right are Tyler Shaw, Adam S. Watkins, Zachary D. Kurtz, Eric A. Forte, Christopher M. Gifford, and Stephen A. Hayes. Not pictured are Sean T. Happel, Patricia K. Murphy, Clifford I. Olsen, and Pedro Rodriguez Jr.

Eric A. Forte, Christopher M. Gifford, Sean T. Happel, Stephen A. Hayes, Zachary D. Kurtz, Patricia K. Murphy, Clifford I. Olsen, Pedro A. Rodriguez Jr., Tyler Shaw, and Adam S. Watkins earned the 2018 award for the onboard space-based automatic target recognition system that can respond in real time for time-critical missions.

## THE BOLDIES

In early 2018, Lab management brought together a team of technical leaders and contributors and asked them what they would recommend to increase APL's boldness. This group, Team Bold, proposed instituting two formal awards to celebrate boldness.

### Bumblebee Award

The Bumblebee Award recognizes improbable designs that had remarkable results, much like APL's historic Bumblebee program, whose name was inspired by a quote attributed to aviation pioneer Igor Sikorsky:

> According to recognized aerotechnical tests the bumble-bee cannot fly because of the shape and weight of his body in relation to the total wing areas. BUT, the bumblebee doesn't know this, so he goes ahead and flies anyway.

The 2018 Bumblebee Award was presented to Douglas S. Adams, Peter D. Bedini, Kenneth E. Hibbard, David J. Lawrence, Ralph D. Lorenz, Shannon M. MacKenzie, David H. Napolillo, Kristin S. Sotzen, Elizabeth P. Turtle, and Lawrence S. Wolfarth for the Dragonfly Titan mission concept, creating a rotorcraft that would explore dozens of locations on Saturn's moon to study the composition of Titan's organic material in detail.

**Bumblebee Award:** From left to right are Ralph D. Lorenz, Peter D. Bedini, Elizabeth P. Turtle, Kenneth E. Hibbard, Shannon M. MacKenzie, Kristin S. Sotzen, and Douglas S. Adams. Not pictured are David J. Lawrence, David H. Napolillo, and Lawrence S. Wolfarth.

**Noble Prize:** From left to right are Nicole L. Whewell, Bradley A. Barrett, and Kyle L. Anderson. Not pictured are Arthur S. Francomacaro, Justin D. Osborn, Jacob L. Sandler, and Paul G. Velez.

### The Noble Prize

The second of the Boldies, the Noble Prize celebrates work that was not fully successful but taught us a lot. Its name is a play on Nobel Prize and noble failure.

The Noble Prize for 2018 was awarded to Kyle L. Anderson, Bradley A. Barrett, Arthur S. Francomacaro, Justin D. Osborn, Jacob L. Sandler, Paul G. Velez, and Nicole L. Whewell. The team attempted to reverse engineer a complex Microsoft Internet-of-Things device on a tight timetable as part of a Microsoft Capture the Flag challenge to find three secrets hidden on a Microsoft Sopris secure processor. They were not successful, but their work helped determine capability gaps for APL to address.

## AWARDS FOR INNOVATION IN 2018

To position the Lab to respond to increasingly complex national challenges and to capitalize on rapid technological advances, APL's leaders have introduced several initiatives to encourage innovation across the Lab. One of these initiatives, Project Catalyst, offers staff members three funding opportunities for bold, high-risk, and transformational ideas that will ensure our nation's preeminence in the 21st century. Staff members submit ideas in response to challenges posted during several cycles throughout the year. Peers vote on the submissions, and finalists receive funding to develop their ideas.

### Ignition Grant Prize for Creativity and Potential Impact

The inaugural Project Catalyst award, the Ignition Grant Prize, was presented for the first time in 2013 for the project judged to be most creative and to have the greatest potential impact.

The 2018 award went to David M. Brown, Xiomara Calderon-Colon, Victoria J. Campbell, and Michael H. Jin for fabricating a transceiver made of a biological optical fiber and successfully demonstrating using plant stems 2–6 cm long at an optimum optical wavelength.

**Ignition Grant Prize:** From left to right are David M. Brown, Michael H. Jin, and Victoria J. Campbell. Not pictured is Xiomara Calderon-Colon.

### Combustion Grant Prize for High-Risk, High-Impact Technical Ideas

The Combustion Grant Prize, first presented in 2017, recognizes high-risk, high-impact technical ideas.

Robert W. Chalmers, Grace M. Hwang, Clare W. Lau, Kevin M. Schultz, and Bryanna Y. Yeh were awarded for their 2018 work on phase-based control of autonomous robotic swarms to minimize computational cost and maximize scalability and performance through novel emergent behaviors.

### Year 3 Propulsion Grant Awards (Tie)

And, finally, presented for the first time in 2018, the Propulsion Grant Award honors ideas that were selected for their third year of funding.

**Combustion Grant Prize:** From left to right are Robert W. Chalmers, Grace M. Hwang, and Kevin M. Schultz. Not pictured are Clare W. Lau and Bryanna Y. Yeh.

**Year 3 Propulsion Grant Award (tie):** From left to right are Daniel S. Berman, Nathan H. Parrish, Jared T. Zook, and Anna Loskiewicz-Buczak. Not pictured is Benjamin D. Baugher.

Benjamin D. Baugher, Daniel S. Berman, Anna Loskiewicz-Buczak, Nathan H. Parrish, and Jared T. Zook were presented a 2018 award for developing methods to forecast the occurrence of disruptive events in time to prepare for or prevent them.

Edward J. Birrane III, David J. Copeland, Brian K. Haberman, Subodh S. Harmalker, and Caleb W. Wang were presented a 2018 award for demonstrating how to adapt proven commercial technologies to spacecraft to integrate multiple constellations, enabling highly robust and resilient space-based communications.

## AWARDS FOR OUTSTANDING ACCOMPLISHMENTS IN 2018

### Outstanding Mission Accomplishment Awards

The Outstanding Mission Accomplishment Award, first presented in 2014, recognizes major achievements in mission-oriented programs and projects. Awards are given in two categories: a current challenge and an emerging challenge. For both types, a review team of top managers and executives from APL's sectors and mission areas solicits nominations for technical accomplishments in sponsored programs during the previous year. A program has to have achieved a significant milestone within the previous fiscal year to be eligible. The panel judges entries on technical excellence and potential impact.

#### *Mission Accomplishment for Current Challenge*

The 2018 award went to Andrew S. Driesman, Kim A. Cooper, Patrick A. Hill, and Kimberly M. Runkles for Parker Solar Probe—APL's Mission to Touch the Sun. A scientific investigation sought for more than 60 years, Parker Solar Probe was finally successful because of APL's engineering expertise, scientific leadership, and robust program management. The mission was enabled by a novel mission trajectory design and cutting-edge thermal engineering advances to protect the mission on its dangerous journey.

#### *Mission Accomplishment for Emerging Challenge*

Hicham Alkandry, Matthew D. Collett, Nicholas W. Houriet, and Jonathan T. Schwalbe earned the 2018 award for advanced target concept development, enabling the nation to address threats in the near-space domain.

### Enterprise Accomplishment Award

The Enterprise Accomplishment Award, first presented in 2015, recognizes the enterprise accomplishment with the greatest impact on APL's operations and culture of innovation. The winner is selected by a joint panel of APL's operations executives and managing executives.

**Year 3 Propulsion Grant Award (tie):** From left to right are David J. Copeland, and Edward J. Birrane III. Not pictured are Brian K. Haberman, Subodh S. Harmalker, and Caleb W. Wang.

**Mission Accomplishment for Current Challenge:** From left to right are Kimberly M. Runkles, Patrick A. Hill, Kim A. Cooper, and Andrew S. Driesman.

**Mission Accomplishment for Emerging Challenge:** From left to right are Nicholas W. Houriet, Jonathan T. Schwalbe, and Matthew D. Collett. Not pictured is Hicham Alkandry.


**The Alvin R. Eaton Award:** Erik D. Justen.

The 2018 award was presented to Jigar R. Amroliwala, Angelina H. Boampong, James H. Clark, T. Clay Gump, William S. Kallmeyer, Eric M. Kessler, Larry Loza, Patricia L. Miller, Nancy L. Parsons, and Adam K. VanderHook for the classified enhancements project, providing the Laboratory with streamlined and improved service and response times for requests and incidents and increasing the ability of Lab-wide IT to keep up with the demand in support of sponsor requirements.

## The Alvin R. Eaton Award

The Alvin R. Eaton, or ARE, Award has been presented annually since 2001 but was not presented publicly during the awards ceremony until 2016. It honors staff members who have spent much of their careers leading remarkable achievements that we cannot talk about. The awardee is selected by APL's director and assistant director for programs.

Erik D. Justen, the chief engineer for advanced systems in the Air and Missile Defense Sector at APL, earned the award for technical contributions and leadership for the Future Systems integration project that have resulted in unparalleled revolutionary military capabilities for the defense of our nation.

## Director's Award for Special Achievements

And, finally, sometimes a major accomplishment is outside the usual award categories. The Director's Award for Special Achievements recognizes such accomplishments. This award was first presented in 2017, and Lab management proudly presented it again for accomplishments in 2018.

Brad S. Bazow, Jennifer L. Cooper, Charles B. Cooperman, Jean M. Dougherty, Brian J. Grooman, Robert F. Henrick, Rachel S. Hodapp, Gabriel P. Kniffin,

**Enterprise Accomplishment Award:** From left to right are Larry Loza, Eric M. Kessler, Patricia L. Miller, T. Clay Gump, Jigar R. Amroliwala, and Adam K. VanderHook. Not pictured are Angelina H. Boampong, James H. Clark, William S. Kallmeyer, and Nancy L. Parsons.

**Director's Award for Special Achievements:** From left to right are Gabriel P. Kniffin, Robert F. Henrick, Brian J. Grooman, Brad S. Bazow, Carlos A. Renjifo, Jean M. Dougherty, G. Scott Peacock, and Jennifer L. Cooper. Not pictured are Charles B. Cooperman and Rachel S. Hodapp.

G. Scott Peacock, and Carlos A. Renjifo earned the award for their project on advancing the future of acoustics—demonstrating the conceptualization of the physics, then developing and validating the end-to-end sensor design, processing algorithms, and feasibility of implementation.

## PUBLICATION AWARDS FOR 2018

Administered by the editorial board of the *Johns Hopkins APL Technical Digest*, the publication awards program aims to inspire and recognize scholarship through publication in the professional literature. Awards were first presented in 1986, and the nomination and selection process remains the same: Departments and sectors may submit up to two nominations in each category. Judges consider the works' significance and clarity, giving considerably greater weight to the significance of the work in advancing science, engineering, or the mission of the Laboratory.

### Author's First Paper in a Journal or Proceedings (Tie)

An award was presented to Patrick B. Dandenault for "MENTAT: A New Wind Model for Earth's Thermosphere," published in the *Journal of Geophysical Research: Space Physics* (volume 123, issue 8, August 2018, pp. 7124–7147).

An award was presented to Peter M. Thielen for "Exploration of the Molecular Basis of Blast Injury in a Biofidelic Model of Traumatic Brain Injury," published in the journal *Shock Waves* (volume 28, issue 1, January 2018, pp. 115–126).

### Outstanding Paper in the *Johns Hopkins APL Technical Digest* (The Walter G. Berl Award)

Named for Walter Berl, the *Digest* editor-in-chief at the inception of the publication awards program and who oversaw the program for many years, the award went to Douglas S. Adams, Peter D. Bedini, Kenneth E. Hibbard, David J. Lawrence, Ralph D. Lorenz, Shannon M. MacKenzie, Patrick N. Peplowski, Colin Z. Sheldon, Kristin S. Sotzen, Elizabeth P. Turtle, and Lawrence S. Wolfarth for "Dragonfly: A Rotorcraft Lander Concept for Scientific Exploration at Titan," published in the *Johns Hopkins APL Technical Digest* (volume 34, number 3, October 2018, pp. 374–387).

**Walter G. Berl Award:** From left to right are Peter D. Bedini, Shannon M. MacKenzie, Kristin S. Sotzen, Colin Z. Sheldon, Kenneth E. Hibbard, Douglas S. Adams, Elizabeth P. Turtle, and Ralph D. Lorenz. Not pictured are David J. Lawrence, Patrick N. Peplowski, and Lawrence S. Wolfarth.

### Outstanding Research Paper in an Externally Refereed Journal Publication

The 2018 award went to Scott E. Wunsch for "Harmonic Generation by Nonlinear Self-Interaction of a Single Internal Wave Mode," published in the *Journal of Fluid Mechanics* (volume 828, October 2017, pp. 630–647).

**Author's First Paper in Journal or Proceedings (tie):** Peter M. Thielen. Not pictured is Patrick B. Dandenault.

**Outstanding Research Paper in an Externally Refereed Journal Publication:** Scott E. Wunsch.

**Outstanding Development Paper in an Externally Refereed Publication:** From left to right are Bliss G. Carkhuff, Rengaswamy Srinivasan, and Plamen A. Demirev.

## Outstanding Development Paper in an Externally Refereed Publication

Bliss G. Carkhuff, Plamen A. Demirev, and Rengaswamy Srinivasan earned the 2018 award for "Impedance-Based Battery Management System for Safety Monitoring of Lithium-Ion Batteries," published in *IEEE Transactions on Industrial Electronics* (volume 65, issue 8, August 2018, pp. 6497–6504).

## Outstanding Special Publication

The 2018 award was presented to Grace M. Hwang and Shane W. Lani for "Ultrasonic Modulation of Neural Circuit Activity," published in *Current Opinion in Neurobiology* (volume 50, June 2018, pp. 222–231).

## Outstanding Conference Paper

The 2018 award went to Eyal Bar-Kochba, David W. Blodgett, Aaron T. Criss, Tom B. Criss, Jason R. Harper, Grace M. Hwang, Clare W. Lau, Carlos A. Renjifo, Carissa L. Rodriguez, and Clara A. Scholl for "Brain Imaging for Neural Tissue Health Assessment," in *Proceedings of SPIE Volume 10639, Micro- and Nanotechnology Sensors, Systems, and Applications X*.

**Outstanding Conference Paper:** From left to right are Grace M. Hwang, Carlos A. Renjifo, Tom B. Criss, Aaron T. Criss, David W. Blodgett, Carissa L. Rodriguez, and Clara A. Scholl. Not pictured are Eyal Bar-Kochba, Jason R. Harper, and Clare W. Lau.

## R. W. HART PRIZES FOR EXCELLENCE IN INDEPENDENT RESEARCH AND DEVELOPMENT IN 2018

The R. W. Hart Prizes for Excellence in Independent Research and Development—first presented in 1989 and named for former APL assistant director for research and exploratory development Robert W. Hart—recognize 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 their quality and importance to APL. Prizes are awarded in two categories: best research project and best development project.

**Outstanding Special Publication:** From left to right Shane W. Lani and Grace M. Hwang.

**R. W. Hart Prize for Best Research Project:** From left to right are Andrew L. Golato, Matthew S. Paoletti, and Thomas E. Ruekgauer. Not pictured is Kevin H. Foster.

## Best Research Project

The 2018 award went to the project called Remote Characterization of Ocean Turbulent Microstructure, with principal participants Kevin H. Foster, Andrew L. Golato, Matthew S. Paoletti, and Thomas E. Ruekgauer.

## Best Development Project

The winning project for 2018 was Advanced Hypersonic Autopilots, with principal participants Jeffrey D. Barton, Brandon T. Coloe, Gregg A. Harrison, Kenneth F. MacFarlane, and David A. Snyder.


**R. W. Hart Prize for Best Development Project:** From left to right are Gregg A. Harrison and Jeffrey D. Barton. Not pictured are Brandon T. Coloe, Kenneth F. MacFarlane, and David A. Snyder.