

# APL Achievement Awards and Prizes: The Lab's Top Inventions, Discoveries, and Accomplishments in 2022

APL Staff Writers

## ABSTRACT

*For 80 years, APL's dedicated staff members have made thousands of critical contributions to critical challenges in trusted service to the nation. They have delivered game-changing solutions in diverse areas—undersea warfare, space exploration, missile defense, cybersecurity, artificial intelligence and autonomy, biology and bionengineering, and the environment to name just a few. The incredible dedication and achievements of the Lab's staff are enabled by outstanding enterprise services; a deep-rooted culture of innovation; a commitment to diversity, equity, and inclusion; and an emphasis on the mission. Every year the Lab honors these accomplishments with an awards program. This article details the awards presented for achievements during 2022, APL's 80th year.*

## INTRODUCTION

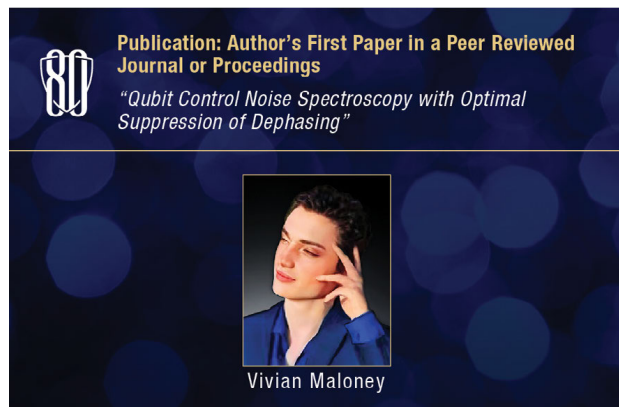
On April 25, 2023, APL honored nearly 200 staff members for their exceptional contributions in 2022, the Lab's 80th year, during its annual Achievement Awards ceremony. For awards honoring outstanding publications and notable projects, individuals, and teams throughout the Lab, 753 staff members were named in 144 nominated entries in 25 categories. Ultimately, 168 staff members were recognized for 31 winning entries. The virtual ceremony celebrated staff members' outstanding work in areas such as publications, Independent Research and Development (IRAD) projects, internally funded innovation initiatives, inventions, mission and enterprise accomplishments, and more.

This article details the winning staff members and their achievements. Because the awards program is open to only current APL staff members, only APL contributors are named. These projects and accomplishments

exemplify what APL staff members have been doing for 80 years: making critical contributions to the nation's most critical challenges.

## PUBLICATION AWARDS

The publication awards, first presented in 1986, are the genesis of APL's annual Achievement Awards program. Administered by the *Johns Hopkins APL Technical Digest* editorial board, these awards encourage and honor scholarship through publication in the professional literature. Departments and sectors may submit up to two nominations in each of the eight award categories. Judges consider the nominated works' significance and clarity, giving considerably greater weight to the significance of the work in advancing science, engineering, or APL's mission.



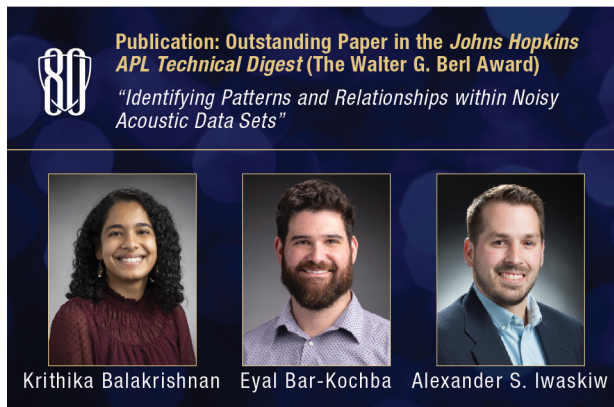
### Author's First Paper in a Peer-Reviewed Journal or Proceedings

The award for an author's first paper published in a journal or proceedings in 2022 went to Vivian Maloney for "Qubit Control Noise Spectroscopy with Optimal Suppression of Dephasing," published in *Physical Review A*.<sup>1</sup> This paper introduces a protocol to characterize amplitude noise, which causes faulty gates. Understanding noise that causes errors in quantum devices is essential to the ability to build better quantum computers. The protocol is robust to competing sources of error, allowing amplitude noise to be characterized in regimes where it was previously impossible.

### Walter G. Berl Award – Outstanding Paper in the Johns Hopkins APL Technical Digest

This award recognizes excellence in APL's own technical journal, which has been published since 1961. The honor is named for Walter Berl, who was editor-in-chief of the *Digest* when the publication awards program was created and who oversaw the program for many years.

The 2022 award went to Krithika Balakrishnan, Eyal Bar-Kochba, and Alexander Iwaskiw for "Identifying Patterns and Relationships Within Noisy Acoustic Data Sets."<sup>2</sup> This paper is part of an issue highlighting work from staff members in the Lab's Discovery Program, a 2-year rotational opportunity that allows new college graduates a unique opportunity to experience APL's wide array of technical challenges.<sup>3</sup> It describes a novel methodology for understanding biomechanical fracture and characterizing acoustic signatures with



distinct failure modes, leveraging a creative fusion of existing individual tools for analysis. This methodology is aiding our understanding of human injury, enabling more efficient evaluation of trauma effects and, ultimately, better protection.

### Outstanding Research Paper in an Externally Refereed Publication

Two awards were presented for outstanding research papers published in externally refereed publications in 2022. The first went to Plamen Demirev, James Johnson, Jesse Ko, Nam Le, Collin McDermott, Danielle Nachman, and Zhiyong Xia for "Destruction of Per/Poly-fluorinated Alkyl Substances by Magnetite Nanoparticle-Catalyzed UV-Fenton Reaction," published in *Environmental Science: Water Research & Technology*.<sup>4</sup> This team developed an eco-friendly, nontoxic, cost-effective, and reusable technology to destroy per- and poly-fluorinated alkyl substances (PFAS) in drinking water. The technology, which is scalable to industrial applications, reduces these "forever chemicals" in drinking water by more than 90%.



The second award went to Stefan Allen, Ra'id Awadallah, Brian Gibbons, and Andrew Goers for "Natural-Modes Expansion of Microwave Fields Emitted by Ultra-Short Pulse Laser Illumination of a Conducting Wire," published in *IEEE Transactions on Electromagnetic Compatibility*.<sup>5</sup> This paper describes a rigorous theoretical model corroborated by experimental verification of radio frequency (RF) emissions due to ultra-short pulse laser illumination of metallic targets. It presents definitive evidence that a major contribution to RF emissions is transient current, which flows to neutralize the charge induced on the target by laser ablation.

### Outstanding Development Paper in an Externally Refereed Publication

Two awards were also presented for outstanding development papers published in externally refereed publications in 2022. The first, again recognizing work on PFAS, went to James Johnson, Jesse Ko, Nam Le, Danielle Nachman, K. Michael Salerno, and Zhiyong Xia for "Removing Forever Chemicals via Amphiphilic Functionalized Membranes," published in *npj Clean Water*.<sup>6</sup> This paper presents evidence that APL-synthesized novel materials capture PFAS from water more efficiently than currently available filters. Computer simulations successfully predict the capture properties of these novel materials. The developed theoretical and experimental methods can be expanded to synthesis of new materials for efficient water clean-up from other toxic chemicals.

The second award was presented to Andrew Badger, Matthew Fifer, David

Handelman, Luke Osborn, Francesco Tenore, Brock Wester, and Jared Wormley for "Shared Control of Bimanual Robotic Limbs with a Brain-Machine Interface for Self-Feeding," published in *Frontiers in Neurobotics*.<sup>7</sup>

 **Publication: Outstanding Research Paper in an Externally Refereed Publication**  
*"Natural-Modes Expansion of Microwave Fields Emitted by Ultra-Short Pulse Laser Illumination of a Conducting Wire"*






Stefan R. Allen
Ra'id S. Awadallah
Brian B. Gibbons
Andrew J. Goers

 **Publication: Outstanding Development Paper in an Externally Refereed Publication**  
*"Removing Forever Chemicals via Amphiphilic Functionalized Membranes"*






James K. Johnson
Jesse S. Ko
Nam Q. Le
Danielle R. Nachman




K. Michael Salerno
Zhiyong Xia

 **Publication: Outstanding Development Paper in an Externally Refereed Publication**  
*"Shared Control of Bimanual Robotic Limbs with a Brain-Machine Interface for Self-Feeding"*



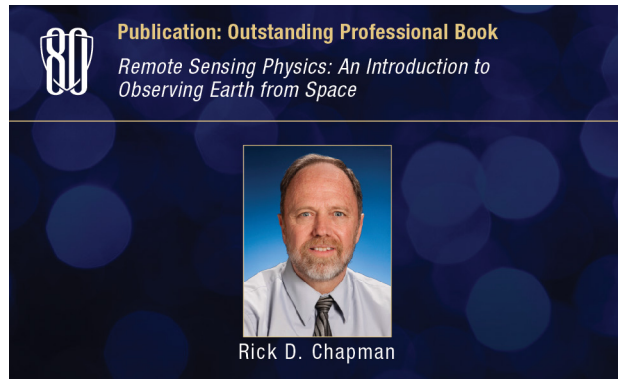



Andrew R. Badger
Matthew S. Fifer
David A. Handelman
Luke E. Osborn





Francesco V. Tenore
Brock A. Wester
Jared M. Wormley



These researchers demonstrated for the first time that an intelligent shared control strategy can enable a human with brain implants to manipulate bimanual robotic limbs to cut and eat food. This work opens new possibilities for restoring quality of life and enhancing human function through novel human-machine teaming.

### Outstanding Professional Book

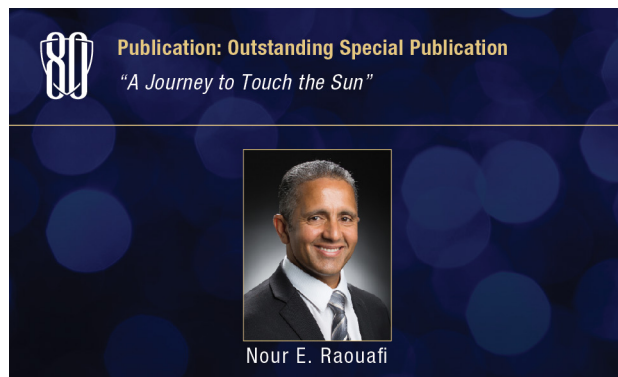
The award for outstanding professional book published in 2022 went to Rick Chapman for *Remote Sensing Physics: An Introduction to Observing Earth from Space*, co-published by the American Geophysical Union and John Wiley & Sons.<sup>8</sup> This advanced textbook examines the physical principles underlying remote observations of Earth using passive and active electromagnetic sensors in the visible, infrared, and microwave bands.

### Outstanding Special Publication

Nour Raouafi was presented the Outstanding Special Publication Award for “A Journey to Touch the Sun,” published in *Physics Today*.<sup>9</sup> This *Physics Today* cover article describes the Parker Solar Probe, which is braving extreme conditions to explore the mysterious solar corona, a region that harbors some of the most difficult-to-understand phenomena in astrophysics.

### Outstanding Conference Publication

The Outstanding Conference Publication Award recognizes the value of participating in conferences



to meet colleagues and establish professional contacts. The award for 2022 went to Kimberly Ord for “Parker Solar Probe Pre-Launch Mission Operations Orbit-in-the-Life Mission Simulation,” published in the SpaceOps 2021 post-conference book *Space Operations: Beyond Boundaries to Human Endeavours*.<sup>10</sup> Kimberly, the Parker Solar Probe deputy mission operations manager, led the prelaunch development and execution of the mission operations “orbit-in-the-life” and early operations mission simulations performed using the spacecraft during thermal vacuum testing. This paper describes the challenges, lessons learned, and anomalies encountered.

### Lifetime Achievement Publication Award

Lifetime Achievement winners are not selected every year. In fact, only six have been named over the past decade. This award honors an author’s career of achievement through a substantial body of publications that are significant in terms of peer recognition, prizes, citation frequency, or influence on the innovation ecosystem. In 2022, Andy Cheng from APL’s Space Exploration Sector was presented the Lifetime Achievement Publication Award for his historic publications advancing space science from the Voyager missions to, most recently, the Double Asteroid Redirection Test (DART) mission. Andy published his first scientific paper in 1974 as a graduate student and has since added over 200 more to his curriculum vitae.





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

The R. W. Hart Prizes for Excellence in Independent Research and Development (IRAD)—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 IRAD. 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.

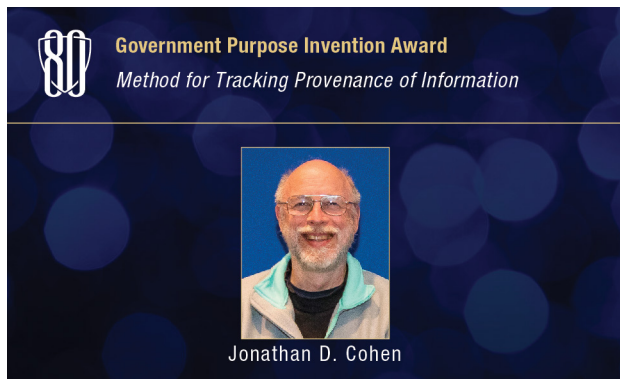
### Best Research Project

The award for the best IRAD research project in 2022 went to principal participants Plamen Demirev, Claresta Joe-Wong, James Johnson, Phillip Johnson, Jesse Ko, Nam Le, Danielle Nachman, K. Michael Salerno, Luke Skala, and Zhiyong Xia for Water and Beyond.

### Best Development Project

The award for the best 2022 IRAD development project was presented to Jessie Barrick, Robert Bruce, Joseph Centurelli, Nora Lane, Joseph Miragliotta, Lance Oh, David Shrekenhamer, Juliana Vievering, Angelos Vourlidas, and Chad Weiler for Multifunctional Metasurface Optics.





## INVENTION AWARDS

### Government Purpose Invention 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.

The award for innovation in 2022 went to Jonathan Cohen for Method for Tracking Provenance of Information.

### Invention of the Year Award

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 winner of the Invention of the Year Award for 2022 is Will Coon for System to Augment Restorative Sleep.

### Master Inventor Award

Lab management first presented the Master Inventor Award in 2007 to honor those staff members who have demonstrated a career of innovation with 10 or more patents based on APL intellectual property. To date, only 33 staff members have attained the honor. In 2022, the Lab was incredibly proud to add Joseph Miragliotta<sup>11</sup> to the list of APL Master Inventors.

## AWARDS FOR INNOVATION

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.<sup>12</sup> One of these initiatives, Project Catalyst, offers staff members three funding opportunities for bold, high-risk, 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. Awards recognize excellent work that is part of these initiatives.

### Ignition Grant Prize

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 2022 award went to Meera Kesavan, Joel Sarapas, and Scott Shuler for ICICLE: Ice Crystallization Inhibitor Coatings for Low-temperature Environments.

### Combustion Grant Prize

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

Ryan Carter, Gehn Ferguson, Mark Graybeal, Alexander Lark, and Steven Szczesniak were recognized for their 2022 work on Thermal Management for Additive Hypersonic Leading Edges.

### Propulsion Grant Year 3 Prize

And, finally, presented for the first time in 2018, the Propulsion Grant Prize honors ideas that were selected for their third year of funding. Three teams earned this prize in 2022.

Greyson Brothers, Noah Ford, Naveed Haghani, Thomas Urban, and John Winder earned a third year of funding for Beyond Human Reasoning — Bridging the Information Gap.

The second team selected for a third year of funding includes Ra'id Awadallah, Sean Ellison, Chester Hewitt, Francesca McFadden, and Jordan Wiker for Early Warning Network.

**Combustion Grant Prize for Innovation**  
*Thermal Management for Additive Hypersonic Leading Edges*

Ryan H. Carter	Gehn D. Ferguson	Mark L. Graybeal	Alexander R. Lark	Steven R. Szczesniak

**Propulsion Grant Prize for Innovation**  
*Beyond Human Reasoning — Bridging the Information Gap*

Greyson Brothers	Noah P. Ford	Naveed E. Haghani	Thomas J. Urban	John J. Winder

**Propulsion Grant Prize for Innovation**  
*Early Warning Network*

Ra'id S. Awadallah	Sean M. Ellison	Chester H. Hewitt	Francesca R. McFadden	Jordan R. Wiker



Janna Domenico, Megan Hannegan, Nam Le, Carlos Martino, Ryan McQuillen, and K. Michael Salerno were awarded another year of funding for their project Novel Optimal Biomagnetic Sensor.

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.

## AWARDS FOR OUTSTANDING ACCOMPLISHMENTS

### Mission Accomplishment Awards

The Outstanding Mission Accomplishment Awards, first presented in 2014, 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, a review team of top

### For a Current Challenge

Awards were presented for two 2022 accomplishments. The first went to core team members Elena Adams, Nancy Chabot, Michelle Chen, Andy Cheng, Zachary Fletcher, Jeremy John, Daniel O'Shaughnessy, Edward Reynolds, Andy Rivkin, and Evan Smith for DART,<sup>13</sup> the first-ever mission to demonstrate asteroid deflection by a kinetic impactor.







The second award was presented to core team members Charles Goldblum, Christopher Griffin, Christopher James, N. Jordan Jameson, Patrick Lee, Maureen O'Connor, Bradley Potteiger, David Sames, and Jacklyn Truong for creating an unprecedented capability for the Department of Defense.

**For an Emerging Challenge**

The award for the 2020 mission accomplishment for an emerging challenge went to principal contributors Rui Chen, David James, Marina Johnson, Adaleena Mookerjee, Brandon Patterson, Eric Ross, Cory Sheffer, Michael Thompson, Craig Williams, and Robert Zaborowski for completing a comprehensive program of at-sea testing and analysis for an advanced Navy sensor.

**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. Winners are selected by a joint panel of APL's operations executives and managing executives. Two teams were honored for their work in 2022.

The first award recognized DART impact media and guest events, with the team led by Mike Buckley, Brooke Hammack, Lee Lachman, Tricia Latham, John O'Brien, Duane Pickett, Steven Smith, Justyna Surowiec, Shannon Thornton, and Jessica Tozer for coordinating the DART media outreach campaign and guest event that allowed a global audience to witness the world's first planetary defense test mission.





**Outstanding Enterprise Accomplishment Award**  
*DART Impact Media and Guest Events*

				
Michael R. Buckley	Brooke R. Hammack	Lee C. Lachman	Patricia A. Latham	John E. O'Brien
				
Duane M. Pickett	Steven G. Smith	Justyna M. Surowiec	Shannon L. Thornton	Jessica L. Tozer



**Outstanding Enterprise Accomplishment Award**  
*Hiring Talent for APL in a Challenging and Unprecedented Recruiting Environment*

			
Joseph M. Ames	Eliza S. Bell-Andrews	Jenny A. Danick	Bryant S. Garcia
			
Carrie N. Gingras	Denise L. Hockensmith	Camille Y. Stauffer	

The second award recognized hiring in a challenging recruiting environment, with the team led by Joseph Ames, Eliza Bell-Andrews, Jenny Danick, Bryant Garcia, Carrie Gingras, Denise Hockensmith, and Camille Stauffer for hiring talent for APL in a challenging and unprecedented recruiting environment.

**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 openly. Awardees are selected by APL's director and assistant director for programs.

Eric Adles was honored with this award for leading precision navigation and timing (PNT) radio frequency photonics and optical communications projects.



**Alvin R. Eaton Award**



Eric J. Adles

## Director's Award for Special Achievements

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. Two awards were presented for special achievements in 2022.

The first award went to team members Charles Anderson, John Atchison, Sarah Bergman, Carolyn Eady, Tri Freed, Thomas Johnson, Brennan Movius, J. Greg Near, Jerry Richard, and Ed Russell for providing systems engineering expertise in direct support of government space capabilities.

The second award went to principal participants Timothy Allensworth, Michael Dennis, John Mack, Michael Purcell Lee Rogers, James Sari, Elad Siman-Tov, Clara Smart, Benjamin Turek, and Chad Weiler for

developing a novel sensing approach to protect critical infrastructure.

## THE "BOLDIES"

In early 2018, Lab management asked a team of technical leaders and contributors for recommendations on increasing APL's boldness. This group, Team Bold, proposed instituting two formal awards to celebrate boldness.

## Bumblebee Award

The first 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 bumblebee 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 Bumblebee Award recognizing 2022 achievements was presented to Chace Ashcraft, Jay Brett, David Chung, Marisa Hughes, Anshu Saksena, Jennifer Sleeman, Caroline Tang, and Larry White for developing the Physics-informed AI Climate Model Agent Neuro-symbolic Simulator (PACMANS) for Tipping Point Discovery,<sup>14</sup> a hybrid AI climate modeling approach that enables the discovery of tipping points that would have catastrophic effects on our planet.

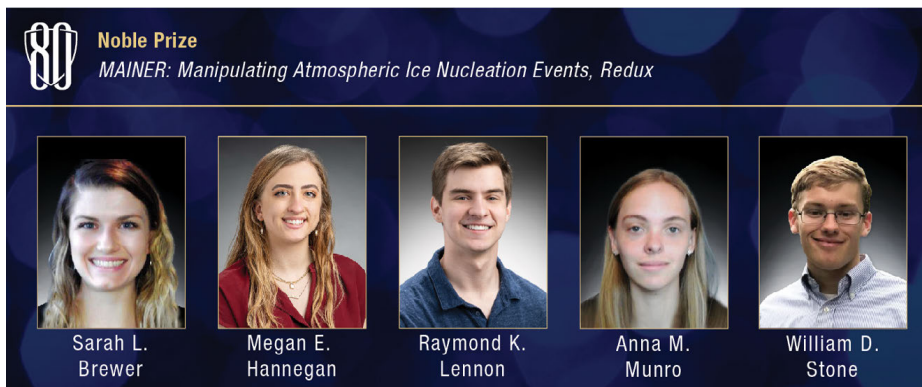
**Noble Prize**

The second award in this category, the Noble Prize, celebrates work that was not fully successful but yielded valuable lessons. Its name is a play on Nobel Prize and noble failure.

The Noble Prize for 2022 was awarded to Sarah Brewer, Megan Hannegan, Raymond Lennon, Anna Munro, and William Stone for MAINER: Manipulating Atmospheric Ice Nucleation Events, Redux, which targets the development of novel bio-derived cloud seeding applications.

**LIGHT THE FUSE AWARD**

The Light the FUSE Award was first presented during the 2021 ceremony. The award name is a play on the acronym FUSE, referring to APL’s FUSE employee resource group, which created this award, as well as the Lab’s general innovation theme. FUSE, which stands for Fostering Unity and Staff Empowerment, is a consolidation of representatives from APL’s affinity groups, sectors, and departments who are focused on enhancing the Lab’s work environment and culture of innovation. This award recognizes significant contributions that promote a positive, diverse, and inclusive culture at the Laboratory, increasing APL’s potential for innovation.





The 2022 award went to Jennifer Benzing, Stephanie Berry, Gill Brown, Megan Leahy-Hoppa, Molly Nichols, and Felipe Westhelle for establishing their sector's Diversity and Inclusion Ambassadors program.

Siddique, and Christopher Watkins for developing an analysis-based game executed for senior leadership from multiple US government organizations.

### APL ANALYTICAL ACHIEVEMENT AWARD

The newest honor is the Analytical Achievement Award, which recognizes the most insightful analytic work that resulted in a critical contribution to a government decision-maker or program. It was first presented during the 2022 ceremony.

The Analytical Achievement Award was presented to core team members Timothy Allensworth, Toni Matheny, Robert Miceli, Jeffrey Miers, Fazle

### CONCLUSION

APL staff members have an 80-year legacy of making critical contributions in pursuit of solutions to the nation's most critical challenges. The Lab's annual Achievement Awards, which have been presented for almost 40 years of APL's storied history, recognize many of these contributions. For a brief history of APL's awards program, refer to the article by Richardson and Livieratos in the issue commemorating APL's 75th anniversary.<sup>15</sup> This same issue includes a complete list of



winner through 2017 (for 2016 achievements).<sup>16</sup> Summaries of the winners for achievements in subsequent years are also available in the *Digest*.

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