AEROCONTACT

AEROSPACE ENGINEERING AT MARYLAND

Uncommon Times, Bold Leadership

DARRYLL J. PINES TAKES THE HELM AS UMD'S NEW PRESIDENT

Chairman's Corner

CHALLENGING TIMES AND A NEW UMD PRESIDENT

The past months have been unlike anything most of us have experienced. COVID-19 has impacted our lives in ways both big and small; we worry not only about our personal health, but about friends and family. Some of us have lost loved ones to the pandemic. Meanwhile, the research that provides the engine for our department—and, indeed, fuels the economy through its capacity to yield innovation—has been severely constrained.

Yet even amid the difficulties of the past months, there have been reasons to feel encouraged, even inspired. It has been heartening, for instance, to see so many faculty and members of the university community working together to assist the response to COVID-19 and help put the country back on track.

At UMD, we have also marked a milestone that is well worth celebrating: on July 1st, Darryll J. Pines became president of the University of Maryland.

As many of you know, Dr. Pines served for more than a decade as dean of the A. James Clark School of Engineering, where his extraordinary leadership propelled an era of major growth in our programs and resources. All of us at UMD are proud and excited about our new president—and doubly so at the aerospace engineering department. After all, Dr. Pines began his academic career as a UMD aerospace professor and, later, department chair. In this issue of *AeroContact*, we provide an opportunity for you to learn more about President Pines, his goals and priorities, and his deep commitment to advancing diversity in institutions of higher education.

The job of a university president is hardly an easy one, even in normal times, and the times now are anything but normal. But Dr. Pines, as we invite you to discover, has always been one to embrace challenges, seeing in them opportunities for positive change. All of us who know him, whether as his colleagues or as students, can attest both to his vision and his determination to follow through. Stay tuned for great things to come!

Despite the circumstances, UMD aerospace engineering continues to advance, with bold new research in areas ranging from robotics to orbital mechanics. You'll read about some of these endeavors in this issue. Meanwhile, we continue to be grateful for the generosity of our alumni community, and we hope that you will continue to be engaged in the months ahead. For many of our students, COVID-19 has had a devastating financial impact, and your continued and unwavering support has never been more essential.

Norman M. Wereley
MINTA MARTIN PROFESSOR AND CHAIR
DEPARTMENT OF AEROSPACE ENGINEERING

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Please send letters to the editor and alumni notes to aero-comms@umd.edu.

FEARLESS VISIONARY

Darryll J. Pines Becomes UMD President

Helicopters weren't his specialty—at least not then. As a newly-hired assistant professor of aerospace engineering at the University of Maryland, Darryll J. Pines brought expertise on the structural dynamics of larger aircraft: he'd written his doctoral thesis at the Massachusetts Institute of Technology on the topic.

Rotorcraft presented a considerably different set of engineering challenges, but that excited rather than deterred Pines. "He's not someone who prefers to stay in his comfort zone," recalls Inderjit Chopra, Distinguished Professor of aerospace engineering and director of UMD's Alfred Gessow Rotorcraft Center (AGRC). "Many professors prefer not to move around and try new things, but Darryll is the opposite. His way is to seek out new research endeavors and then work very hard to accomplish them."

Immersing himself in the subject, Pines began to investigate ways in which helicopter drivetrains—notoriously vulnerable to failure—could be improved. Within three to four years, he had gained international recognition as an authority on the subject. Pines' work, along with Chopra's, helped establish UMD as one of only a few universities where significant research was being conducted in this area.

(CONT. ON PAGE 2)

PATH TO THE PRESIDENCY

MARCH 1995
Darryll Pines joins the UMD aerospace engineering faculty

OCTOBER 2003–OCTOBER 2006
Defense Science Office and Tactical Technology Office program manager at DARPA

In the years ahead, he would bring the same *carpe diem* mindset to a succession of roles: as a program manager at the Defense Advanced Research Projects Agency (DARPA), where he focused on micro and nano air vehicles, and then at UMD again, as aerospace engineering chair. In 2009, fourteen years after first joining the UMD faculty, Pines became dean of the university's A. James Clark School of Engineering, overseeing the expansion of its programs and facilities, and securing the largest philanthropic gift in its history. In 2019, he received one of the highest professional honors bestowed on engineers: induction into the National Academy of Engineering (NAE). And in 2020, Pines became the 34th President of the University of Maryland, succeeding Wallace D. Loh. He is the fifth engineer to lead UMD, after Nariman Farvardin, C.D. "Dan" Mote, John Slaughter, and Robert L. Gluckstern, and the second African-American to hold the presidency or chancellorship, after Slaughter.

Pines has assumed leadership of the university at a critical time. Early in 2020, only weeks after the University System of Maryland (USM) Board of Regents announced his appointment, the COVID-19 pandemic escalated and the United States went into lockdown. Universities abruptly found themselves facing a perfect storm of challenges, from transitioning students online, to adopting more stringent health and safety practices, to mapping out long-term plans to reboot campus life. In May, another inflection point occurred for the nation: the killing of George Floyd while in police custody. This unfortunate loss of life prompted what some have described as the most significant civil rights movement in America since the 1960s, with calls to examine and rectify the continued structural racism that pervades U.S. societal institutions, including higher education.

Leading a university during a volatile era requires decisiveness and a readiness to act, and Pines has wasted no time since taking the helm. In addition to spearheading the university's plans for responding to COVID-19 and prioritizing the health and safety of the campus community, he is part of the joint task force in Prince George's County, Maryland—home to the University of Maryland's College Park campus—that is guiding the county's response to the pandemic. Pines has also moved quickly to address lingering inequities and promote a more inclusive environment at the university. On his first day as president, he launched 12 new initiatives and recommendations to reaffirm our commitment to our core mission and values, and to one another—five of which aim to create a more inclusive environment by increasing student, faculty, and staff diversity, providing unconscious-bias and anti-racism training, diversifying the curriculum, and examining community policing practices.

MILESTONES FOR AEROSPACE ENGINEERING AND THE CLARK SCHOOL

UMD's new president has a reputation as a change-maker, going back to his early years in the aerospace engineering department. His work in helicopter engineering is one example: Pines raised the profile of a field that, until then, had remained relatively obscure, with much of its research kept under wraps. Another example his colleagues point to is his leadership of UMD's bid for the $250,000 Sikorsky Prize.

Few engineering competitions have ever offered such a rich incentive; also unmatched was the level of difficulty. Contenders had to design, build, and fly a human-powered helicopter that could meet ambitious requirements for height and endurance, and then be able to land it within a tightly circumscribed space. Interest in the endeavor had dropped off since the prize was first announced in 1980: multiple attempts had failed to get off the ground, often literally. By the turn of the 21st century, the general consensus was that the feat was impossible to achieve and not worth the time and effort required to try.

Darryll Pines with the 2012 Gamera Human-powered helicopter team.

Chopra, the AGRC director, recollects the state of affairs. "The quest for the Sikorsky Prize was dead—everyone had given up. Then this guy comes along and decides to restart it," he said. "Once again, it's a totally new area for him. Very little in his research background has prepared him to venture into human-powered helicopters. But he does, and he remains deeply involved with it." Although a competing team ultimately edged out a victory and took home the prize, UMD's team and its Gamera I and II helicopters achieved multiple world records and a place in the Guinness Book.

The Sikorsky Prize endeavor is one of the best-remembered highlights of Pines' time as aerospace professor and chair, a milestone with a permanent place in departmental lore, but it

OCTOBER 2006–JANUARY 2009
Chair of aerospace engineering

JANUARY 2009–MARCH 2020
Farvardin Professor and Dean of the A. James Clark School

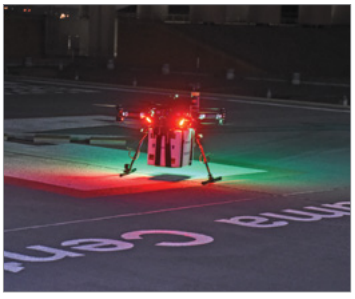
FEBRUARY 2019
Elected to National Academy of Engineering (NAE)

JULY 2020
Pines takes office 34th President of UMD, succeeding Wallace D. Loh

E.A. Fernandez IDEA Factory groundbreaking.

Dedication of A. James Clark Hall.

A historic gift from the A. James and Alice B. Clark Foundation.



The first-ever delivery by UAS of a live organ for transplant.

was hardly his only contribution. As chair (October 2006 to January 2009) Pines reinvigorated the department's hypersonics program and supported the rotorcraft program. Drawing from his three-year leave of absence at DARPA, he helped set up a new program dedicated to micro air vehicles—an area of study that served as the forerunner to later research into drone applications, including delivery drones.

Pines encouraged the students he advised to set their sights high, recalls Suneel Sheikh, CEO of Advanced Space and Technology Research Laboratories (ASTER Labs), who earned his doctorate at UMD with Pines as his advisor. "Probably the most important research lesson I learned from him is to never think small. Always think way beyond what you can do today, and keep striving for unattainable goals," he said. "He has a tremendous capacity to pursue something big that has never been done before, while encouraging people around him with a never-give-up attitude."

In 2009, Pines took up the leadership of the Clark School as dean, a position he would hold for just over 11 years. It would prove to be a time of major strides for engineering at Maryland. Pines has overseen significant growth in the college's footprint, including three new buildings—A. James Clark Hall, the forthcoming E.A. Fernandez IDEA Factory, the first privately-funded building on campus, and the future Interdisciplinary Engineering Building. His fundraising initiatives have been the most successful in UMD history. During his tenure as dean, he raised more than $240 million for the university's $1 billion Great Expectations Campaign in 2013, and exceeded the $500 million goal for UMD's Fearless Ideas Campaign, months ahead of schedule. A crowning moment in the Clark School's history came in 2018, when the A. James & Alice B. Clark Foundation came forward with a nearly $220 million investment in the school and its students. The gift, *Building Together: An Investment for Maryland*, is the largest ever awarded to UMD, and the sixth largest to any public institution nationwide.

As dean, Pines has also fostered partnerships with both the government and private sector, often cultivating relationships he established at DARPA. "Darryll was always willing to reach out to other institutions, both in the greater Washington, D.C. area and nationally," said Robert Briber, who became interim dean of the Clark School in March, following Pines' selection as president. "He understood that a partnership required mutual benefit to both sides. When he came to the table, he brought the best of the Clark School to the table: our faculty, our innovation, our facilities. He knew that a successful partnership required both sides to do that. He always pushed the other side to be equally forthcoming. That led to many successful partnerships over the years."

One such partnership is UMD's collaboration with the Naval Air Systems Command (NAVAIR) in Southern Maryland, which led to ongoing educational and research interactions with the Navy base—and to the establishment of the UMD Unmanned Aircraft Systems (UAS) Test Site, as part of the aerospace engineering department. Those efforts paved the way for yet another bold step. In April 2019, the Test Site collaborated with the University of Maryland Center (UMMC), the University of Maryland School of Medicine (UMSOM), and the Living Legacy Foundation to conduct the first-ever delivery of an organ for transplant by unmanned aerial vehicle.

From left: former UMD president Wallace D. Loh, current president and former aerospace engineering chair Darryll J. Pines, and current aerospace engineering chair Norman M. Wereley.

When UMD aerospace chair Norman Wereley was a graduate student at the Massachusetts Institute of Technology (MIT), he shared an office with another gifted young engineer named Darryll J. Pines. Both would go on to faculty positions at the University of Maryland, with Pines eventually becoming department chair, and Wereley succeeding him in that role after Pines became dean of the A. James Clark School of Engineering.

From early on, Pines demonstrated the vision and drive that enabled him to steer the aerospace engineering department, and later the Clark School, to illustrious new heights, Wereley recalls. "At every level he's been in, he's looked for bigger and better ways to do things. That's one of his hallmarks," he said.

Case in point: an unusual flight that took place in the early hours of April 19, 2019. Those awake and watching might have mistaken the phenomenon for a low-flying UFO; in reality, a custom-built UAV had lifted off from a parking lot in West Baltimore, carrying a kidney for transplant into a waiting patient. The mission, based on a concept of operations facilitated by Wereley, resulted in a successful, life-saving operation, and constituted a breakthrough that could ultimately revolutionize organ delivery. While some deans might have balked at an undertaking of this kind, with its inherent uncertainties, Pines gave it his full support.

"Darryll has always been a proponent of tackling big challenges and going after firsts," Wereley said. "It's something that really motivates him, and it's a perspective that fits well with aerospace engineering, with our long history of firsts, going back to the first flight."

"To me, he's been a great colleague for many, many years. We're very proud that someone who came into our department as an assistant professor has made such great strides in his career that he is now president of UMD," adds Wereley. "That's pretty amazing, and we're all very happy about that. It's takes a special skill set to be a president, and he has that skill set."

UAS Test Site launch event

Matt Scassero, director of the Test Site, first met Pines during talks on the UMD-NAVAIR collaboration. Six years later, they shared the stage at an official launch event for the UAS Test Site, established as a result of the partnership. Five years after that, they were addressing reporters at a crowded press conference as UMD, UMMC and UMSOM announced the successful organ flight.

"Darryll will recognize an idea that has value and hold onto it, even if it needs time to mature," Scassero said. "He senses when the time is optimal—when the demand signals are there, the right conditions. He has a 'stick-with-it' approach that, I think, has been very much part of the Clark School's success over the past decade."

John Langford, founder of Aurora Flight Sciences and former member of the aerospace engineering department's Board of Visitors, has known Pines in multiple capacities: as fellow graduate students at the MIT, as partners in a DARPA program to develop micro air vehicles, and as collaborators in shaping the future direction of the UMD aerospace engineering program.

Pines has "an amazing touch with people," Langford said. "Not all technologists do: in fact, it's rare to find someone who is both a brilliant engineer and also has the mix of empathy, humility, and social graces that is needed to work effectively with just about anyone."

STUDENT-CENTERED LEADERSHIP

Langford's words are echoed by colleagues past and present, at UMD and beyond. All cite the new president's approachability and the importance he places on building rapport, whether with industry partners, alumni and donors, or UMD faculty.

Pines greeting alum at networking event.

It's a characteristic he also brings to his interactions with students at both the undergraduate and graduate levels. Far from being a remote figure, Pines was well-known during his tenure as dean for engaging students in informal conversations and for the active role he has taken in fostering and encouraging student competitions.

"I think one of Dr. Pines' favorite activities is just being with students. He really enjoyed seeing competition teams

work together," said Briber, the interim dean. "I think that was one of the things that gave him the most joy of being a faculty member and then a department chair, and eventually dean of the college. He enjoyed talking to students, interacting with them, learning about the projects, seeing where they were running into trouble, providing suggestions and pushing them to give their best and to compete at the highest levels."

As dean, Pines also continued to teach an undergraduate class alongside his many administrative responsibilities. Given his belief that engineers should think big and not shy away from the most difficult, complex endeavors, the focus of his class—Engineering Grand Challenges—should come as no surprise. Students who have taken the course say he encouraged them to rethink what it means to be an engineer.

"He presents the view that engineers are impactful, that we can change the world," said Jwoyal Ranjit, a sophomore in aerospace engineering. "The phrase he uses is that 'engineers create solutions for people in society.' Those four keywords—creating, solutions, people, society—are all essential," Ranjit said.

As part of the class, Pines would instruct students to identify an emerging technology that addressed one of the National Academy of Engineering's 14 Grand Challenges, from reducing carbon footprints to harnessing nuclear fusion to restoring and improving urban infrastructure. For Kristen Yee, a sophomore in mechanical engineering, the class was instrumental in helping her decide what kind of engineer she wanted to be. "He asked us engaging questions that prompted us to really think about what we can do with what we learn, and how we can pull it together into one grand idea that is feasible in the real world and timely, that can better the world over the coming decade."

Pines' mentorship of students has not been limited to the classroom or to a formal advising capacity; he is also renowned at the Clark School for his enthusiastic involvement in the annual Alumni Cup and other competitive events, and for his general availability for off-the-cuff conversations. He could be found outside of the office, conferring with students, parents, or faculty so frequently that staff nicknamed him "the walkabout dean." As important as top-level strategizing has been for the Clark School's change-maker, the pulse of community life—and the situational awareness gleaned from day-to-day interactions—has always been of value to Pines.

To Suneel Sheikh, Pines' approachable nature exemplifies a personal trait that complements his drive and decisiveness: despite a succession of leadership roles, culminating first in the deanship of a top-ranked engineering program and now the presidency of a flagship university, Pines is not one to make others feel small.

"He has always treated me like an equal, even when I was just a student without much expertise or experience," Sheikh said. "He doesn't have a look-down-upon-you attitude; he doesn't convey the sense of 'you're the student and I'm the advisor'. It's more like we're doing a project together, working together to bring about a result that has value. That made a big impression on me—it seemed like the best way ever to achieve the goal of conducting sustainable research with excellent results."

"It's an approach that will serve him well as president," Sheikh said.

- National Science Foundation Advance program to improve diversity in engineering
- Partnerships with Lockheed Martin, Northrop Grumman, Leidos, Bechtel, Exelon, Sikorsky, and Boeing
- Building Together: the $220 million Clark Foundation investment
- Mpact Lecture Series
- Engineering For Us All (E4USA) curriculum pilot program
- Over 50 new labs, including Fearless Flight Facility, Startup Shell, Leidos Innovation Lab, Whiting-Turner Infrastructure Engineering Labs, and Terrapin Works

A LASTING LEGACY AS DEAN

Unravelling the Mysteries of Asteroids

OBSERVATIONS OF BENNU SHOW ASTEROID SURFACES ARE MORE CHANGEABLE THAN MANY ASSUMED

NASA's Goddard Space Flight Center in Greenbelt, Maryland provides overall mission management, systems engineering, and the safety and mission assurance for OSIRIS-REx. Dante Lauretta of the University of Arizona in Tucson, is the principal investigator, and the University of Arizona also leads the science team and the mission's science observation planning and data processing. Lockheed Martin Space in Denver built the spacecraft and is providing flight operations. Goddard and KinetX Aerospace are responsible for navigating the OSIRIS-REx spacecraft. OSIRIS-REx is the third mission in NASA's New Frontiers Program, which is managed by NASA's Marshall Space Flight Center in Huntsville, Alabama, for the agency's Science Mission Directorate in Washington.

IMAGE: NASA/GODDARD/UNIVERSITY OF ARIZONA

In 2018, the OSIRIS-REx spacecraft arrived at asteroid Bennu to begin its three-year mission to survey, map, and ultimately collect a sample from the asteroid's surface.

However, during OSIRIS-REx's first year in operations around Bennu, scientists encountered an unexpected phenomenon. While reviewing survey photos taken from the spacecraft, one of the OSIRIS-REx team scientists noted apparent eruptions of particles off the asteroid's surface.

This was a surprising find. Until recently, scientists viewed asteroids as dead rocks that floated around in space, not really changing much.

"We expect material to be coming off of comets, but not asteroids," explains UMD aerospace engineering professor Christine Hartzell, a participating scientist on the OSIRIS-REx team. Her area of research specializes in the behavior of regolith, also known as asteroid dust.

"I wanted to see if it was an electrostatic phenomenon or not," said Hartzell. "Because if this phenomenon happens anywhere in the solar system, it's going to happen on asteroids because they are so much smaller than, for example, the moon, so it would be easier for particles to come off a surface."

While Hartzell's simulations did not ultimately explain the observations the team was seeing on Bennu—the ejected particles were too large and moving too fast for the forces she was able to model—she was able to show that electrostatic forces could be responsible for detaching smaller, micron size grains from the asteroid. That could explain why researchers have not been seeing this smaller dust on the asteroid's surface.

"We'd expect to see a flat, featureless surfaces if it was covered with sand," said Hartzell. "But we don't really see that. One hypothesis is that these very small particles were created by micro meteor bombardment that breaks up a rock into many smaller pieces, but then maybe

PHOTO: NASA

electrostatic forces sweep all the small pieces away, and that's why we don't see them on the asteroid."

Hartzell now wants to look at the balance between how long it takes to create these small particles and how long it takes before they are swept away, if they are swept away at all.

"Another hypothesis is instead of being swept away from the surface, they're being jiggled into the center of the asteroid," Hartzell adds. "If the asteroid is kind of a gravel pile, and you have some little particles on the top of it, and the asteroid shakes, because of a micrometeorite bombardment, then maybe the small particles work their way in between those larger grains."

These grains, if they do migrate towards the asteroid's center, could create a kind of cement at the asteroid's core. Understanding if this happens to an asteroid could tell us how difficult it would be to break it up or deflect it if it posed a danger to earth.

In addition, if asteroids turn out to have more variation in surface or interior composition than was previously thought, it will become more critical to understand these processes for future exploration missions that will use asteroids as stopping points or fueling stations.

As for the observed particle behavior on Bennu, the OSIRIS-REx team ultimately landed on three possible explanations: meteoroid impacts, thermal stress fracturing, and released water vapor.

The team's findings, "Episodes of particle ejection from the surface of the active asteroid (101955) Bennu" were published in *Science* in December 2019.

ENGINEERING ROBOTIC STARFISH

Echinoderm-inspired robots could perform many difficult, dangerous tasks.

With their flexibility and dexterity, starfish and other echinoderms have long intrigued robotics researchers. But replicating the functionalities of these unique sea creatures is no simple endeavor.

"Their appendages twist and bend in ways that are difficult to model," explains Derek Paley, director of the Maryland Robotics Center and a professor in the aerospace engineering department and the Institute for Systems Research. "To design similar appendages, we not only have to recreate their texture, but be able to simulate the way they move and respond to environmental stimuli. It's a complex engineering task—and a programming challenge as well, requiring high levels of computational power."

Over the past three years, Paley has been the principal investigator on a project aiming to create soft underwater robot appendages that mimic the behavior of sea stars, brittle stars, and basket stars, collectively known as radially symmetrical echinoderms. Paley's colleagues on the project are UMD aerospace engineering chair Norman Wereley; Carmel Majidi, associate professor at Carnegie Mellon University; James Weaver, senior research scientist at Harvard University; and Professor Robert Wood, also of Harvard University.

Their work, funded by the Office of Naval Research's Basic Challenge Program, has resulted in prototypes and plans for further development.

"Right now, the appendages we've built can bend in a single plane, but we want them eventually to be able to twist and bend in multiple planes," Paley said. "We're aiming to develop the sensor and actuator network further so that the appendages can respond to stimuli and function with a minimum of human control. And we'd ultimately like to be able to use 3-D printing in place of the current molding and dipping process, which is both costly and laborious."

"The 'holy grail' would be if we can send the design over to Terrapin Works or a similar makerspace and have them 3-D print a starfish-inspired robotic appendage," Paley said.

Beyond the cool factor, such creations would have numerous practical applications. In the not-too-distant future, underwater robots of the kind being developed by Paley's team could be used to secure ports and harbors, perform ocean cleanup, assist the military in mine disposal, or perform any number of underwater tasks that are perilous for humans.

Longer-term, Paley envisages robotic starfish operating in groups, creating sensor networks that could be used to explore inaccessible parts of the ocean. With further advances in machine learning and autonomy, the robots would be able to carry out tasks with a minimum of human intervention; moreover, because their intelligence would be distributed across a network, an individual robot could fail or malfunction without compromising the system as a whole.

SEA-STAR-inspired robots are only one of Paley's avenues of exploration in what is commonly known as soft robotics; he is also working to design and program robotic fish—capable of flapping their tails, moving in circles, and propelling themselves in a way similar to their non-robotic counterparts.

"We tend to think of robots as having hard, metallic exteriors, but that's increasingly not the case," Paley said. "There are immense advantages to more flexible, pliant structures."

"The time will come when we don't refer to this line of research as 'soft robotics,'" he said. "It will just be robotics."

Thunderstorms at Mach 6

WHAT HAPPENS AT HIGH SPEEDS WHEN THE FLIGHT ISN'T ONLY THROUGH AIR?

Aerospace engineers are familiar with the need to account for factors such as rain, sea spray, or solid particles that can influence the physics of flight; such "multiphase flows" have been the subject of extensive research. However, studies so far have been confined largely to low-speed flight regimes. Experts in hypersonic flight have focused mainly on single-phase flows, working on the assumption that a plane or missile will be flying only through air.

"Up to this point, there hasn't been much overlap between those who study multiphase flows and those who are interested in hypersonic flight," explains Stuart Laurence, an associate professor in the UMD aerospace engineering department.

Laurence is part of a six-member team that recently won a Multidisciplinary University Research Initiative (MURI) award from the Department of Defense (DoD) that will support research aimed at closing the gap. The project is being led by Thomas Schwartzentruber at the University of Minnesota and also includes researchers from the Stevens Institute of Technology and the University of Hawaii.

To obtain a clearer understanding of how, for instance, millimeter-sized raindrops in a thunderstorm could influence the flight of a projectile/object traveling at Mach 6, the team will be conducting a combination of experiments and simulations. Laurence will be spearheading the experimental side, using a wind tunnel to replicate different combinations of flows. But the wind tunnel won't suffice for all aspects of the experiment, as Laurence explains.

"You have limitations as to the size of the droplets you can introduce into the flow," he said. "It's much easier to accelerate a gas through a wind-tunnel nozzle than to accelerate a droplet. If you want to accelerate the flow to Mach 6, that's no problem, but if you want to accelerate a flow with large droplets to Mach 6, it's going to be a lot harder. So we are building a light gas gun where we launch projectiles through a stationary atmosphere that contains the droplets."

MURI grants are provided by the DoD with the aim of tackling difficult, but important, research challenges that require significant resources. Studying the effects of multiphase flows fits the bill, Laurence said.

"In the past, this was a neglected area of research because there wasn't really anything traveling at Mach 6 that was going to be affected," he said. "With the new interest in hypersonics, it's become a critical issue. As you can imagine, large raindrops impacting a projectile at those speeds are likely to cause damage and affect the flow field significantly."

"It's important for us to understand precisely what would happen."

CHUNG, ZHANG CO-AUTHOR PAPER ON BLUE WHIRL

Newly-graduated aerospace engineering Ph.D. students Joseph D. Chung and Xiao Zhang are co-authors of a new paper—published in August by *Science Advances*—that details the structure of the blue whirl, a type of swirling flame that burns heavy, liquid fuels without producing soot. The paper's co-authors also include UMD aerospace engineering faculty member Carolyn Kaplan and Texas A&M TEES Eminent Research Professor Elaine S. Oran, who discovered the blue whirl in 2016.

Chung and Zhang are the recipients of 2020 Departmental Research Awards for work related to the use of computational algorithms in studying the phenomenon.

Becnel Receives SAMPE Grant to Support STEM Outreach Activities

Aerospace Engineering faculty member Andrew Becnel was awarded a $5,000, two-year grant from the Society for the Advancement of Material and Process Engineering (SAMPE) to support STEM outreach activities with FAMES® | Finance, Arts and STEM.

In partnership with the University of Maryland's SAMPE@UMD student chapter, the FAMES®' mentors work through local Boys and Girls Clubs of Greater Washington (BGCGW) to provide 4-12 grade students with motivational and engaging experiences. Through STEM demonstrations, hands-on activities, and interactions with teachers and students in science and technology fields, the mentors serve as role models for successful and fulfilling technical careers.

Becnel, along with department chair Dr. Norman Wereley, has been involved with FAMES® since 2017. The two have organized and supported a variety of activities introducing young students to aerospace engineering, exploring what it takes to become a successful engineer, teaching hands-on lessons in aerodynamics and airplane flight using balsa wood gliders, model wind tunnels and air cannons, and motivating the young students to seek technical careers.

PHOTO: COURTESY OF FAMES

"We are thrilled to work with Dr. Andrew Becnel, and look forward to the new SAMPE STEM outreach activities for this year," said Dr. Supriya Banerjee, director of FAMES® STEM programs and a member of the aerospace engineering board of visitors. "In addition to STEM demonstrations and lessons, Dr. Becnel provides the essential link between STEM education in school and the exciting and fulfilling range of career opportunities that proficiency in STEM subjects makes possible."

FAMES® | Finance, Arts and STEM is a 501(c) (3) non-profit organization dedicated to mentoring and educating underserved and underrepresented youth in Grades 4 to 12 in Finance, Arts, and STEM subjects.

AWARDS AND PROMOTIONS

Professor **INDERJIT CHOPRA** received the 2019 Japan International Aircraft Development Fund (IADF) Award. He delivered a one-week lecture series at Tohoku and Nagoya Universities, JAXA, and major firms in the rotorcraft industry (Kawasaki and Mitsubishi.

Dr. **AILEEN HENTZ**, Student Services Program Director, received the A. James Clark School of Engineering's 2019-20 Student Advising Award. The award recognizes staff excellence in undergraduate and/or graduate student advising.

CHRISTINE HARTZELL has been promoted from Assistant Professor to Associate Professor with tenure. In announcing the promotion, Aerospace Engineering Chair Norman Wereley noted that Hartzell is a key contributor to a number of NASA projects, including OSIRIS-Rex in collaboration with Johns Hopkins University Applied Physics Laboratory, as well as a NASA NIAC project on orbital debris tracking.

HARTZELL is part of two research endeavors that have received major grants recently. One is LEADER, associated with NASA's Solar System Exploration Virtual Institute (SSERVI). The second project, led by Dan Scheeres of the University of Colorado at Boulder, involves the JANUS reconnaissance missions to binary asteroids.

The University of Maryland has named Professor **DEREK PALEY**, Professor and Maryland Robotics Center (MRC) Director Derek Paley as a 2020-2021 Distinguished Scholar-Teacher. The award honors faculty members who have demonstrated outstanding pedagogy as well as outstanding scholarship.

In addition to leading the MRC, **PALEY** directs the Collective Dynamics and Control Laboratory and is the faculty advisor of the Autonomous Micro Air Vehicle Team.

Pines-Langford Endowed Scholarship Established

With a gift of $250,000, Aurora Flight Sciences founder a John Langford has endowed a full in-state tuition scholarship to be awarded to an aerospace engineering student at the A. James Clark School of Engineering. The gift honors University of Maryland President Darryll J. Pines, whose work with micro and unmanned aerial vehicles helped pave the way for Aurora's success.

The Pines-Langford Endowed Scholarship is merit-based, with preference given to students who have distinguished themselves through significant achievements in entrepreneurship, student-led projects, research, leadership, or service. "It's a way to support aerospace engineering students at UMD while also celebrating and recognizing Darryll, who played an incalculably important role in the development of Aurora," Langford said.

Aurora, he noted, has built a longstanding relationship with the aerospace engineering department over the years, including support for faculty research and the UMD chapters of the American Institute of Aeronautics and Astronautics (AIAA) and Women in Aeronautics and Astronautics (WIAA). Langford, currently CEO of the startup Electro.aero, is a past president of the AIAA's national organization.

Pattishall Family Establishes Scholarship to Support Women in Aerospace Engineering

The Robert A. Pattishall Endowed Scholarship has been established by Marti Pattishall to honor her late husband and preserve his dedication to supporting women in engineering. The scholarship will support future women in engineering who are active in the Women in Aeronautics and Astronautics (WIAA) Program and who demonstrate a passion for excellence, superior motivation, and intellectual curiosity.

A University of Maryland aerospace engineering graduate (B.S. '69) Robert A. Pattishall, Sr. went on to have a successful career in both the government and private industry. He was the inaugural recipient of two prestigious government awards: the Central Intelligence Agency Engineer of the Year Award, and the National Reconnaissance Office's (NRO) Dr. Joseph V. Charyk Award. Pattishall was the founding father of NRO's Advance Systems and Technology Directorate and pioneered programs that shaped U.S. space posture well into the 21st century.

Throughout his career, he was passionate about both his education and others and encouraged women engineers through mentorship in the field and encouraging his own five granddaughters to pursue STEM courses in school.

Anusha Dixit Awarded Inaugural Mary and Tom Snitch Undergraduate Scholarship

The inaugural Mary and Tom Snitch Undergraduate Scholarship has been awarded to aerospace engineering senior Anusha Dixit.

Dixit has been fascinated by space her entire life, and after an engineering opportunity in high school she realized that field might be the path to fulfilling her dreams.

"I realized I wanted to contribute to space exploration through engineering, by designing and building the telescopes and satellites that help push the envelope of human knowledge in deep space," Dixit said. "Aerospace engineering turned out to be the perfect blend of engineering for the harshness of space to learn more than ever before."

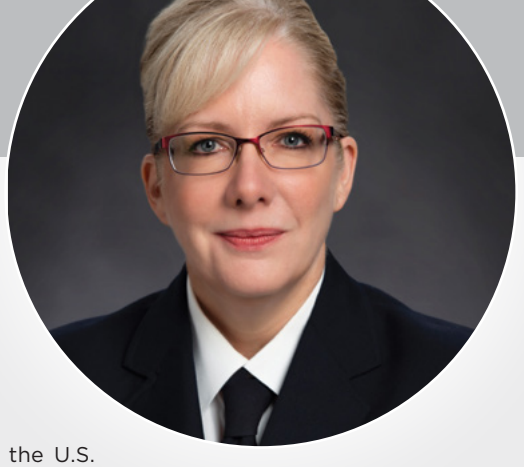
Dixit currently does research with the Planetary Surfaces and Spacecraft Lab on characterizing the Brazil Nut Effect in magnetic granular grains, investigating the formation of magnetic asteroids. She also serves as mechanical lead on the UMD Loop engineering design team, and is responsible for the integration and testing of the four mechanical sub-teams working towards building a Hyperloop Pod to compete annually in SpaceX's Hyperloop Pod Competition.

In addition, she is the Outreach Chair on the executive board of Women in Aeronautics and Astronautics (WIAA), and works on organizing and executing outreach events including the group's e-mentoring program.

After graduation, Dixit aims to work on future space exploration endeavors through systems engineering and testing. In particular, she would like to be involved on the next space telescope or deep space exploration probe, or to support efforts to find life within our galaxy.

Dr. Thomas H. Snitch and Mrs. Mary L. Snitch established the Mary and Tom Snitch Endowed Undergraduate Scholarship to provide merit-based support for undergraduate students in the Department of Aerospace Engineering, with a preference for students participating in the Women in Aeronautics and Astronautics program.

A senior manager at Lockheed Martin, Mary Snitch is very active in a variety of aerospace and education activities. She is a 19-year member of the Advancing Science in America (ARCS) Foundation, and past national president. She also serves on the Board of Directors for the American Institute for Aeronautics and Astronautics (AIAA), the Ron Brown Foundation, and the Aerospace Board of Visitors for the University of Maryland.



SHOW UP, SEIZE OPPORTUNITIES

ALUMNA AND BOEING 737 CHIEF ENGINEERING TEST PILOT JENNIFER HENDERSON (B.S. '97) HAS PURSUED A CAREER IN AVIATION EXCELLENCE.

Experimental, military airplanes decked out in gray and orange were a regular site in the skies over Southern Maryland where alumna Jennifer Henderson (B.S. '97) grew up, and that early exposure to the aircraft from nearby Naval Air Station Patuxent River (NAS Pax River) was the spark that ignited a lifelong fascination with flight.

When it was time to go to college, aerospace engineering was the only field Henderson considered. "I just knew that if I didn't do aerospace engineering, I would not do engineering, period. I would do something completely different."

Starting out at the College of Southern Maryland before transferring to Maryland, Henderson took part in the cooperative education program at the Naval Air Warfare Center (NAWCAD), Patuxent River.

Working as a flight simulation and flight test engineer, Henderson engaged with the test pilots during her work, and realized that being on the aircraft, rather than the ground, was where she wanted to be. "I just loved airplanes so much, and being on the airplanes, experiencing the various test conditions was very exciting for me," said Henderson.

She would stay on at NAWCAD after graduation, serving as a flight test engineer for a variety projects including the F-14 Digital Flight Control System, H-60 shipboard testing for the U.S. Navy, H-46 Ground Proximity Warning System testing, and various shipboard related programs for the U.S. Coast Guard and the U.S. Army.

In 1999, she graduated from the U.S. Naval Test Pilot School as a flight test engineer where she had the opportunity to fly over 20 different fixed- and rotary-wing craft. Now she was poised to embark on a dream she'd cherished since growing up in the 1980s, the era of Top Gun, her dream of becoming a rated, military pilot.

"I just knew then that I wanted to fly in the military. I wanted to fly big, fast jets and I was pretty passionate about it."

However, Henderson almost didn't take the leap to becoming a military pilot. "I was happy with my flight test engineer job because I felt that connection to the military, and I felt like I was doing something meaningful for the Navy helicopter community," explained Henderson. "So when I finally got selected for military pilot training, I was initially uncertain."

A conversation with a close friend tipped the balance: Henderson realized that she would always regret not taking the job. "And I have stood by that ever since," said Henderson. "Seize your opportunities."

Henderson joined the U.S. Air Force Reserves in the wake of 9/11, earning her wings in 2003, and joined a reserve U.S. Air Force squadron in Southern California. Her first mission was a night flight into a blacked-out Baghdad International Airport and she spent the next three years flying C-17s supporting Operations Iraqi Freedom and Operation Enduring Freedom.

"[When you start out] you only have about 200 hours of flight time out of pilot training, and now you're flying this gigantic plane, and you're flying it in theater," said Henderson. "But our squadron had some of the most experienced C-17 pilots in the country, so I feel like I got to learn from the best."

Having returned to civilian life, Henderson has built a successful career as a test pilot for Boeing, a role built out of her military experience and background as a NAWCAD flight test engineer. At Boeing, Henderson is responsible for many aspects of the test flight process, from reviewing and implementing pre-flight checklists, piloting the craft, and post-flight reviews, translating the subjective flight experience back to the engineers.

"As the test pilot, you need to take what you are feeling, hearing and seeing in the airplane and translate that into the engineering world and quantify it," explains Henderson. "It's also our responsibility to mission-relate to the real world, and know what the average pilot is trained to do, and whether the airplane is meeting those expectations."

Since 2005, Henderson has been involved with a number of projects at Boeing, becoming a production test pilot in 2007 for the 737, 777 and 787, an engineering project pilot for the 787-10 project and lead pilot for the Rolls Royce Trent 100 Engine Program. Most recently in 2019, Boeing named her chief pilot for the 737, overseeing the entire fleet, ensuring safe operations, and providing field support. Henderson is also playing a pivotal role on the team working with the FAA and international regulators on safely returning the 737 MAX to operations.

Beyond Boeing, Henderson is a member of the Society of Experimental Test Pilots, and was the first woman elected to its board of directors, serving from 2015 to 2019.

Henderson has built her twenty-five plus year career on a simple, but essential philosophy, "Show up prepared, on time, with a professional presence, and ready to fly," she said. "They allow us to take these airplanes out, and they trust us to flight test them, to take them to their absolute limit and prove that they are safe for our flying public. It truly is a privilege."

COVID-19

Aerospace Engineers Contribute Needed Supplies

WITH LABS CLOSED DUE TO RESEARCH RESTRICTIONS, AEROSPACE ENGINEERS DONATED MASKS, GLOVES, AND OTHER SUPPLIES TO FRONTLINE MEDICAL PERSONNEL.

From left: Mariska Kay Rivera, Abby Shaffer, Dr. Alex Kaysin, Dr. Natelaine Fripp.

PHOTO: COURTESY UNIVERSITY OF MARYLAND FAMILY AND COMMUNITY MEDICINE, UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE

As the country went into lockdown earlier this year, Anya Jones prepared to close her lab. She didn't know when she'd be back.

As she was cleaning up, Jones—an associate professor in the department—wondered if the lab might contain anything that medical personnel could use. Doubtful at first, she began to search. Before long, she had discovered a box full of N95 masks from an old project.

Anya Jones

"I figured if I had more supplies than I realized, others might also," Jones said. She put out a call to other aerospace engineering faculty. Meanwhile, Aileen Hentz, student services program director, got in touch with Alexander Kaysin, assistant professor of family and community medicine at the University of Maryland School of Medicine (UMSOM) and medical director of University Family Medicine, located in downtown Baltimore. Within days, a shipment was on its way to the clinic.

"We had quite a few labs providing supplies and were able to send several boxes and bags to the family medicine practice," Hentz said. Items received included masks, safety glasses, nitril gloves, and bottles of isopropyl alcohol for disinfecting.

Kaysin's clinic is part of the UMSOM Department of Family & Community Medicine. which serves as the backbone for primary care within UMSOM and sees around 35,000 patients annually. He said the donations were much appreciated as they helped replenish supplies due to widespread shortages caused by the COVID-19 pandemic.

"One of the biggest challenges is keeping the clinicians and the staff safe with personal protective equipment (PPE) so they do not expose themselves and contract the COVID-19 infection," Kaysin said.

When shortages occur, he said, medical personnel "may have to use the same equipment again and again, even after it has started to degrade. That's not a safe situation, either for them or the patients they are treating."

Staff at the family medicine practice applauded when they heard of the aerospace engineering department's supply drive. For faculty, staff, postdocs, and students at the department, the effort provided an opportunity for positive action at a time when many of their regular activities were curtailed.

"I feel we made a difference—not only through the supplies we sent, but also through spreading the word to other departments about what we're doing," Hentz said.

Aileen Hentz

Jones and her colleagues continued to make progress on their research while the restrictions were in place, focusing on aspects of their work that can be done outside the lab, such as data analysis and modeling. As for the supplies sent, "we all preferred that it be put to use, rather than sitting in the corner of an empty lab."

The University of Maryland Medical System and the UMD School of Medicine continue to welcome donations of supplies. To arrange a delivery, please contact Paul Jaravata, Director of Practice Operations in Family and Community Medicine, at jaravata@som.umaryland.edu.

Student Snapshot

Staying on Track During COVID-19

The realities of COVID-19 in 2020 have greatly altered the college experience landscape, but aerospace engineering students are finding ways to adapt and succeed in this ever-evolving environment.

"There have been a lot of challenges involved in the transition to online learning," said rising senior Anwesha "Aerik" Moitra. Moving home, he says, entailed more distractions, and even though Moitra found ways to stay connected with classmates via Zoom, it's been harder to stay motivated to do the work. Keeping a schedule has helped. "It's corny, but do it," said Moitra. "It really adds some predictability to these unprecedented times."

Among the things that students miss most: in-person interactions with peers and instructors. "Zoom meetings just don't feel the same, and I miss running into someone on campus and striking up a spontaneous conversation," said sophomore Michael Kalin. Still, he adds, there are some pluses. "With asynchronous classes, I've been able to view lectures on my own time. "It enables me to utilize my time more effectively."

Beyond the shift to college life, some students have had to adjust to additional changes to their home life. Soon after online classes began, sophomore Madelaine Lebetkin found herself home and on her own after her mother was called away to stay with an elderly relative for the remainder of the quarantine.

"I suddenly found myself juggling classes, pets, and a household entirely alone," said Lebetkin. "It was difficult and lonely, but I found myself becoming a more independent and self-sufficient person as a result." Lebetkin still completed an AEROS Program internship and two classes online over the summer.

> **"I suddenly found myself juggling classes, pets, and a household entirely alone."**

Moitra says that he's been able to get a head start on researching graduate schools and on the application process. He's also made a point to carve out time for sanity-saving hobbies like art and physical exercise. "Exercise creates endorphins, and endorphins make you happy," he said. Given the current circumstances having such reserves is more important than ever.

(From top): Students Michael Kalin, Madelaine Lebetkin, and Anwesha "Aerik" Moitra, in photos taken prior to the COVID-19 pandemic.

NINE UMD STUDENTS AWARDED 2020 VERTICAL FLIGHT FOUNDATION SCHOLARSHIPS

In another standout year for the University of Maryland, nine out of this year's 29 announced Vertical Flight Foundation (VFF) scholarships went to Department of Aerospace Engineering students.

VFF scholarships include a cash award and recipients are recognized during the Vertical Flight Society's Annual Forum & Technology Display at the Grand Awards Banquet. Congratulations to this year's UMD recipients!

Bachelor's Degree Recipients: RACHEL HARVEY (Raymond W. Prouty Scholarship), **QINGWEN WEI** (Robert P. Ernst Scholarship)

Master's Degree Recipients: RAVI LUMBA (Dean Carico Scholarship), **AMY MORIN** (Dr. E. Roberts 'Bob' Wood Scholarship)

Doctoral Degree Recipients: MIRANDA COSTENOBLE (Eugene K. Liberatore Scholarship), **EMILY FISLER** (Alfred and Elaine Gessow Scholarship), **ABHISHEK SHASTRY** (two-time recipient, Dr. Joseph Hoeg Scholarship), **TYLER SINOTTE** (two-time recipient; Dr. Richard M. Carlson Scholarship), **CHRISTOPHER THURMAN** (Joseph P. Cribbins Scholarship)

Weinstein Wins Atmospheric Flight Mechanics Paper Competition

University of Maryland Ph.D. student and National Science Foundation fellow Rose Weinstein won the Atmospheric Flight Mechanics student paper competition at SciTech 2020 for her work titled "Global Aerodynamic Modeling Using Smoothed Partitioning with Localized Trees in Real Time".

Weinstein's paper introduces the Smoothed Partitioning with Localized Trees in Real Time (SPLITR) method. SPLITR is part of NASA's Learn-to-Fly technology development initiative a program aimed at assessing the feasibility of real-time, self-learning flight vehicles. "The goal of this research is to develop a modeling approach that can be used in real time, onboard an aircraft and that is physically meaningful and easily interpretable," she said.

Weinstein's work will be recognized at the next AIAA Award ceremony at Scitech 2021 and she plans to continue to research the benefits of the new modeling system.

WIAA Marks Five Years at UMD

Women in Aeronautics and Astronautics (WIAA) celebrated its fifth year at UMD in 2019-20. The student-run organization fosters a professional and supportive community by empowering women with opportunities for leadership, technical and professional development, networking, outreach, and advocacy on behalf of female students.

LEARN MORE AT go.umd.edu/WIAAtoday

SAM HOWARD

SAMANTHA HOWARD (B.S. '20) LIKES A CHALLENGE, AND HER CHILDHOOD FEAR OF FLYING DIDN'T STOP HER FROM PURSUING A CAREER WITH THE ULTIMATE GOAL OF BECOMING AN AIRCRAFT TEST PILOT.

"Growing up, I just wondered how in the world it was possible that I safely got to where I was going," said Howard about flying for family vacations. However, a solo trip to her grandparents gave her the chance to see up close some of what made planes fly. "They put me upfront, and because I went on first and came off last, the pilots came out and talked to me, and they let me see the cockpit," explained Howard. "It was then that I met my fear and realized maybe it isn't fear, as much as it is interest."

That experience, an encouraging high school physics teacher, and a part-time job at her hometown airport, set Howard on the path to Maryland to pursue aerospace engineering. The first school she toured, Howard found the type of community and school spirit she enjoyed in high school. "Everyone I talked to seemed like they had pride in it and was proud to be there, which was something I wanted out of college."

She joined Women in Aeronautics and Astronautics (WIAA), first as a member, and then four years serving as a board member. "WIAA really made an impact for me because not only did they push me in ways I didn't push myself, I found a close support network, and I also found mentors that I could look up to that were not only in aerospace, but also as women."

Beyond WIAA, Howard joined the University of Maryland Air Force ROTC program. While she hadn't considered the military as part of her career path, Howard explained, "I realized it was a good way for me to combine everything I want to do in life. I would get to be involved with aviation, potentially fly, but also serve others and be able to impact someone else."

Joining her sophomore year, Howard hasn't looked back. She eventually became the cadet wing commander, overseeing the 200 members of her ROTC program and credits the role with helping her get outside her comfort zone, push her leadership abilities, and be a mentor for others.

Off campus, Howard interned at Lycoming Engines, and when the company offered her the opportunity to use one of their planes to obtain her pilot's license she seized the chance. "I didn't know if I would have this opportunity again," said Howard. "So I went to the airport and the flight school there and started flying!" By the end of the summer, she earned her private pilot's license.

During breaks, Howard also worked at her hometown airport, where she learned about the aviation industry as a functional whole. "They let me learn a little bit of everything," said Howard. From regulations and logistics, to traffic control and runway safety inspections, Howard got a first-hand look at every facet of airport operations. "I like to see the big picture, and from an airport to engineering courses to working at an engine company, I really see how everything ties together to create a final product. Not everyone might understand the science behind what we do in aerospace engineering, but it impacts every person in the world."

Howard's next stop is pilot training at Columbus Air Force Base in Mississippi. "My goal is to fly the C-17," she said. "I'm very interested in the humanitarian aspect of the plane and the missions they fly." Once she gains more flight experience, her ultimate goal is to apply to the test pilot school at Edwards Air Force.

"I'm fascinated by the aerodynamics and the maneuverability of the aircraft," explained Howard. "It all goes back to my original interest in physics, how all of those forces impact an aircraft's capability, and that's why I want to be a test pilot or go into flight test engineering. There have been so many advances in technology even since I first started in aerospace engineering. I'm excited to see what continues and to be a part of it."

Laura Paquin Awarded 2020 Alexander Brown Scholarship and Leadership Award

The Department of Aerospace Engineering named Ph.D. student Laura Paquin the 2020 Alexander Brown Scholarship and Leadership Award recipient. Award recipients are selected based on demonstrated innovative research practices, visionary leadership, and impressive effort in his or her academic pursuits.

Paquin works with Associate Professor Stuart Laurence in the High-Speed Aerodynamics and Propulsion Lab, where she is involved in projects ranging from temperature-sensitive-paint development to Mach-3 particle image velocimetry measurements at the Arnold Engineering Development Complex Tunnel 9.

Her research interests include optical measurement techniques and aerothermodynamics related to reentry flight. Currently her dissertation work investigates the effect of wall-cooling on the boundary-layer stability of a slender cone.

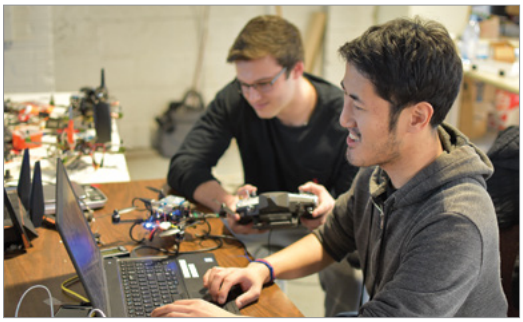
Outside of research, she instructs an undergraduate student seminar in the Flexus program, a two-year living and learning community established in 2007 with the goal of promoting diversity and inclusion in the field of engineering. She is the president of the aerospace Graduate Student Advisory Committee, a Lockheed Martin Achievement Rewards for College Scientists Scholar, Future Faculty fellow, and a former National Defense Science and Engineering Graduate fellow.

The Alexander Brown Scholarship and Leadership Award consists of a monetary scholarship and a commemorative medal. Established in 2011, this award honors the memory and achievements of the late Alex Brown, who was a Ph.D. candidate in the Aerospace Engineering program.

AE Students Triumph at MAV Competition

A team of UMD undergraduate aerospace engineering students and graduate students in the Masters of Engineering in Robotics program took first place in the Fully Autonomous category during the 7th Annual Micro Air Vehicle Student Challenge, held at the Vertical Flight Society Annual Forum in May. The team's advisors are Professor Derek Paley and Dr. Artur Wolek. Sponsors include Heron Systems, Inc., and Leidos.

The Manual Flight category was also won by a UMD team, which included aerospace engineering students Yorick Shah and Qingwen Wei as well students in mechanical engineering, computer science, and mathematics.



Autonomous AMAV Team

KRISHNA BHATU
ROBOTICS ENGINEERING, MASTERS

THOMAS BROSH
AEROSPACE ENGINEERING, FRESHMAN

JERRAR BUKHARI
ROBOTICS ENGINEERING, MASTERS

ADAM DEL COLLIANO
AEROSPACE ENGINEERING, FRESHMAN

ALEX EDWARDS
AEROSPACE ENGINEERING, JUNIOR

KAMAKSHI JAIN
ROBOTICS ENGINEERING, MASTERS

SAIMOULI KATRAGADDA
ROBOTICS ENGINEERING, MASTERS

ZACHARY LACEY
AEROSPACE ENGINEERING, JUNIOR

ABHINAV MODI
ROBOTICS ENGINEERING, MASTERS

IAN MOSS
AEROSPACE ENGINEERING, JUNIOR

KAPIL RAWA
ROBOTICS ENGINEERING, MASTERS

ROHAN SINGH
ROBOTICS ENGINEERING, MASTERS

QINGWEN WEI
AEROSPACE ENGINEERING, FRESHMAN

CONGRATULATIONS TO ALL AEROSPACE ENGINEERING STUDENTS WHOSE ACADEMIC AND RESEARCH ACHIEVEMENTS WERE RECOGNIZED IN 2019-20, INCLUDING:

BALTIMORE-WASHINGTON SAMPE CHAPTER RESEARCH SYMPOSIUM (FIRST PLACE):
JAMES SUTHERLAND

GUSTAVE J. HOKENSON FELLOWSHIP:
SEYHAN GUL

VERTICAL FLIGHT SOCIETY FEDERAL CITY CHAPTER:
SEYHAN GUL

CLARK DOCTORAL FELLOWSHIP:
SHARAN NAYAK, **ELLA VICENTE**

NASA SPACE TECHNOLOGY RESEARCH FELLOWSHIP FELLOWSHIP:
MELISSA ADAMS

PHOTO COURTESY OF JESSE QUINN

Remembering Trevor Quinn

The University of Maryland community mourns the loss of aerospace engineering junior Trevor Quinn, who died in April at the age of 20.

"We're all deeply saddened," said Aerospace Engineering Department Chair Norman Wereley. "Not only was Trevor an outstanding, hardworking student, but he was a thoughtful person who helped inspire others around him to do their best."

Quinn was part of UMD's Gemstone Honors Program and also participated in the Balloon Payload Program. Friends and fellow students recall him as serious-minded yet with a lively sense of humor.

In a piece published by *The Diamondback*, the UMD student newspaper, fellow aerospace engineering student Chris Hoffmann recalled that Trevor "was always the first to crack a joke about how impossible the homework was to do, even though he was the one who did it the best."

Bryan Quinn, his Gemstone advisor, described him as stoic and cool-headed during high-stress moments in the lab, yet often lightening the mood with a comment that would get the whole team laughing. Trevor was "like a ninja with his personality," he told the paper.

Robert Briber, interim dean of the A. James Clark School of Engineering and professor of Materials Science and Engineering, spoke of Quinn's dedication to engineering and his peers.

"He cared about his fellow engineers. As part of the Virtus Living–Learning Program, he worked to make our field more diverse and inclusive. He cared about the future of our profession," Briber said.

"My sincerest hope is that, as we work through our reactions and emotions, we continue Trevor's legacy of building a better engineering profession."

> "Not only was Trevor an outstanding, hardworking student, but he was a thoughtful person who helped inspire others around him to do their best."
>
> NORMAN WERELEY, DEPARTMENT CHAIR

A. James Clark
School of Engineering

Department of Aerospace Engineering
3179 Glenn L. Martin Hall
4298 Campus Drive
University of Maryland
College Park, MD 20742

REIMAGINING DAVINCI

IN THE 15TH CENTURY, artist and engineer Leonardo da Vinci envisioned a craft that flew using a single helix-shaped propeller—the aerial screw—viewed by many as the first vertical takeoff and landing (VTOL) machine ever. Six centuries later, UMD undergraduate and graduate teams took the top spots in the Vertical Flight Society's (VFS) design competiton, which challenged participants to update da Vinci's concept using modern-day analytical and design tools.

ABOVE LEFT: ELICO (FIRST PLACE WINNER, GRADUATE CATEGORY) AND SAMSARA (SECOND PLACE, UNDERGRADUATE).

Learn more at go.umd.edu/modernizing-davinci

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