

PRESIDENT'S MESSAGE



Dr. Ann Elisabeth Rondeau
Vice Adm., U.S. Navy (Ret.)
President, Naval Postgraduate School

“At our core, we are an educational institution ... a university. Our people are passionate about what they teach, how effectively they teach it, and how efficiently our students learn.”

When we started production on this edition of “In Review,” our campus — and the world for that matter — looked quite different. Social distancing was an unknown concept and sheltering in place would have been an almost unimaginable course of action to any threat, foreign or domestic, or global.

On campus, the Winter Quarter was winding down. Classes were nearing completion for the term, we were making preparations for our graduation ceremony, and looking ahead to the new beginnings and new students each new quarter brings.

Exciting developments were in the works! Department of the Navy Chief Learning Officer John Kroger had just finished his second visit to the university since taking the helm of the Naval University System, and we were engaged in critical conversations and planning on ways to enrich our student experiences, and expand our value to the operational forces.

We were actively planning ways to recognize our outstanding Provost, Dr. Steve Lerman, whose contributions to this university are voluminous and enduring. After several years in service to the Naval Postgraduate School, Steve’s leadership has placed the institution in a position of true strength now and into the future. With his retirement from NPS in March, we had hopes of honoring those contributions in ways that could approach just recognition.

Of course, all of that changed in what seemed like a blink of an eye. Before we knew it we had transitioned hundreds of students, professors and classes to online learning. Our stellar team of students, faculty and staff, nearly all in telework status, performed breathtakingly! The first week of Spring Quarter featured more than 1,200 tech-powered online classes to more than 13,700 participants ... With only a handful of help desk calls!

Although distance learning is not the optimal delivery for all programs, the changes we have championed as a team, a university, are truly impressive. In many ways it is times like these, when extreme situations require extreme solutions, that truth in character is revealed. For NPS, in spite of all that has changed, it is what HAS NOT that is revealing about our institution, and the students, faculty, staff and alumni that bring life to it daily, whether they are on campus or not.

In this edition of “In Review,” you will read about a handful of programs that reflect this very ideal. We are expanding our educational programs open to high-performing senior enlisted, and highlight a handful of Marine NCOs currently enrolled in some of these programs. We are quite proud to have these service leaders attending our university and we continue looking for the right opportunities to expand programs to senior enlisted. In fact, the implementation of a graduate certificate program in our National Security Affairs department open to senior Navy enlisted launched in the Spring Quarter without a hitch.

Ongoing, Navy and defense relevant research, such as the efforts in acoustics, optimal family support policies, and innovative maritime network analysis highlighted in this issue, continues. In fact, one of our flagship research programs, the Naval Research Working Group, launches next week, virtually. What is best about this program is that it puts our students and faculty in direct engagement with Navy and Marine Corps leaders, developing research and thesis topics that directly address solutions to the issues that challenge our services the most.

And perhaps most importantly, our cover story features an effort that defined NPS when we started it, and still does. At our core, we are an educational institution ... a university. Our people are passionate about what they teach, how effectively they teach it, and how efficiently our students learn. A pillar of the Navy’s educational strategy, and our own Strategic Plan, is effectiveness, and I am proud to share the exhaustive efforts our community has placed on our own effectiveness in teaching and learning.

All of these are efforts that began well before any of us had even heard of the Coronavirus, and they will continue well beyond it. We are maintaining mission while adjusting, staying true to our core identity and purpose, adapting learning methods in support of continuous education and research. We continue to lean forward, learning all the time.

A handwritten signature in black ink that reads "Ann E. Rondeau". The signature is fluid and cursive, with a large initial "A" and "R".

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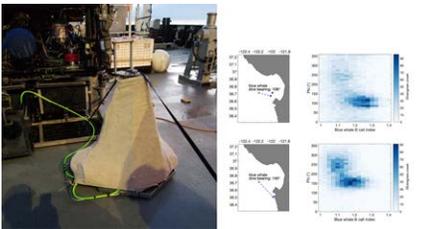
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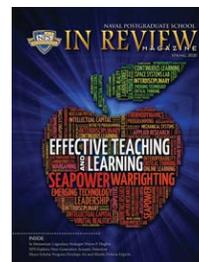
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On The Cover

The Naval Postgraduate School placed a high-priority on the institutional effectiveness of teaching and learning in the development of its 2018-2023 NPS Strategic Plan. What has followed is an ambitious portfolio of initiatives to support faculty development, enrich student experiences and advance learning ... All just in time for the release of the Navy's Education for Seapower strategy.

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GSOIS Dean Robert Dell to Serve as Acting Provost

With the retirement of NPS Provost and Academic Dean Dr. Steve Lerman in late March, Graduate School of Operational and Information Sciences Dean Dr. Rob Dell will serve as Acting Provost while the university conducts a national search for this senior leadership position.

“Steve Lerman is an outstanding leader in every way, and our institution is well-positioned for the future because of it,” said Dell. “Provost Lerman was a tireless advocate for the mission of the university and the faculty who execute it.”

Dell takes on the challenge during a unique time for the university. The COVID-19 pandemic, and the subsequent transition to distance learning as a primary means of delivery, presents the academic enterprise with a distinct challenge to maintain the mission.

“We have been providing outstanding distance learning educa-



Dr. Robert Dell

tion for decades but COVID-19 presents many new challenges” Dell said. “I’m proud of how our NPS team of faculty, staff and students has responded to these challenges.”

Despite the shelter in place orders and social distancing, NPS continues to be fully engaged with Navy leadership advancing initiatives stemming from Education for Seapower.

“Before any of us had heard about the coronavirus, the Navy and Marine Corps was deeply focused on education across the sea service and these efforts are continuing,” Dell says. “NPS plays a critical role in this continuum of education, providing a diverse portfolio of challenging academic programs all grounded in our mission of improving national security.”

“I am deeply honored to have an opportunity to serve as the NPS Provost,” he added.

Chief Learning Officer, OPNAV N7 Engage NPS

Pressing forward on the Sea Service’s comprehensive effort to advance education at all levels, maximizing the intellectual capital and warfighting competence of the force, the DON’s Chief Learning Officer (CLO) John Kroger and Vice Adm. Stuart Munsch, newly-established Deputy Chief of Naval Operations for Warfighting Development (OPNAV N7), paid a visit to the NPS campus, Feb. 19-21, for a series of discussions with leadership and faculty, focused on further implementation of the Education for Seapower (E4S) report and upcoming strategy.

Kroger, a former enlisted Marine and Harvard-trained lawyer with extensive academic teaching and leadership credentials, is the Navy’s first CLO, bringing a vision to strengthen and unify the Navy’s educational institutions to support this strategic initia-

tive. Munsch serves as strategic leader and sole resource sponsor for naval education responsible for directing and resourcing naval education initiatives.



DON Chief Learning Officer (CLO) John Kroger engages NPS faculty and staff during town hall discussion on the E4S strategy and its impact on NPS, Feb. 20.

“Having the CLO and the N7 here at NPS together talking about our curricula, our resources, and all of the opportunities and capa-

bilities on our campus is essential for our institution to be able to support the critical strategic initiatives of the naval education strategy,” said NPS President retired Vice Adm. Ann E. Rondeau.

“The E4S report calls out that we need to resource our educational institutions and our edu-

cational system more effectively,” Kroger said during a town hall with university faculty and staff. “We need to have a quicker tempo and a higher percentage of officers going into rigorous graduate education programs. Many of the areas that we’ve outlined as key priorities for increasing our capabilities, like engineering, technology, resource management, acquisition and information technology, are core areas of expertise here [at NPS].”

According to Kroger, the implementations stemming from the E4S study will impact NPS in a number of ways. The nearest impact involves lab recapitalization, updating research facilities to meet today’s needs, accelerating the capabilities of the broader research enterprise. He also discussed the beginnings of a plan to renovate the central core of the campus to modernize and upgrade buildings.

NWC President Reviews Monterey JPME Program

U.S. Naval War College (NWC) President Rear Adm. Shoshana Chatfield visited NPS to get an up-close look at the NWC Monterey program on the university campus, Jan. 29-30. During her visit, she met with NWC faculty and students, explored NPS' Wargaming Activity Hub, and looked at various innovations in classroom and distance learning technologies.

Recently completing two decades of service, the NWC Monterey program has provided more than 5,500 NPS students with the very same Joint Professional Military Education credit that they would receive in Newport.

"I value life-long learning," Chatfield said during a meeting with NWC faculty. She recalled how, as a pilot, her focus was constantly on operations, on being in



Naval War College (NWC) President Rear Adm. Shoshana Chatfield, left, is introduced to NPS' Wargaming Activity Hub during a visit to the NWC Monterey program, Jan. 29-30.

the cockpit. With the E4S study and report, she said, the Navy is placing a high value on education and intellectual development. That is the space of the War College and NPS, she noted, to tailor educational programs that "continue to develop innovation and intellectual ability."

According to Fred Drake, NWC Monterey Chair, Chatfield expressed keen interest in how NPS is focused on educational effectiveness, using enhanced

instructional design, integrating technology, and researching new teaching methodologies that may be directly applied while maintaining the quality of the education.

"Rear Adm. Chatfield is whole heartedly looking to pull teaching programs into the 21st century, especially those in NWC's College of Distance Education," said Drake. "Due to the timing of her visit, Chatfield was able to see and discuss new innovations in classroom environments being introduced on a small scale here at NPS."

DOE Under Secretary Observes NPS Energy Research

The Honorable Paul Dabbar, Department of

Energy (DoE) Under Secretary for Science met with members of NPS' Energy Academic Group (EAG) to learn more about the university and its contributions to energy research, Jan. 30.

Over the past several years, energy has risen to the forefront as a fundamental enabler to the nation's strategic, operational and tactical mission execution. Over this same period, the university has ramped up an impressive



Dr. Anthony Gannon, center, showcases energy research developed at NPS to DOE Under Secretary for Science Paul Dabbar during a tour of the NPS Turbine Lab, Jan. 30.

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NPS, Volunteers Host Regional Scouts

Although January is months removed from the university's popular "Discover NPS Day," seven Boy Scouts of America (BSA) troops totaling 67 young men and women from across the Central Coast, spent a weekend on the NPS campus for a custom, hands-on STEM-inspired experience.

U.S. Navy Capt. C. Clark Bone, NPS Information Warfare Chair, helped organize the event, recognizing the university's expertise in several areas that could help the Scouts earn treasured merit badges. On top of that, NPS just happened to the place of employment for volunteer Scout leaders across the region, just like him.

Volunteer NPS experts offered interactive lessons in weather, elec-

tronics, oceanography, robotics, electricity, programming, radio and digital technology. By pairing up NPS subject matter experts with trained merit badge counselors, the Scouts were able to learn a lot more than just the minimum requirement to earn the badge.



In addition to faculty volunteers, several NPS students offered their time to help facilitate the event and assist in the merit badge instruction. Navy Lt. Alex Schacht, an NPS student, wanted to be a part of the experience.

"I hope quality instruction can be made available to [my son] the same way it has been for these Scouts," said Schacht. "We are able to offer instruction from experts in the various fields, in a location that provides for excellent hands-on experience."

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portfolio of research in the energy space, some of which was shared with Dabbar and his team.

Department of Mechanical and Aerospace Engineering Associate Professor Anthony Gannon, for example, demonstrated NPS research into turbines and microgrids for space and military base applications. Dabbar quickly noted the opportunity for “cross potential applications.”

Ultimately, leaders hope the introductory visit will pave the way for future partnerships between the university and DOE laboratories. Dabbar noted that access to high-performance computing assets for example, might be one such opportunity to advance that collaboration.

“It is my goal to try to build a strategic relationship between NPS and the DOE labs,” said Dr. Dan Nussbaum, Chair of NPS’ Energy Academic Group, adding that potential areas of joint interest include quantum information sensing and small modular nuclear sensors.

NPS’ CRUSER to Hold xSwarm Workshop

The Naval Postgraduate School (NPS) is calling for participants for its inaugural xSwarm workshop, being held March 25-26 in Monterey to take on this rapidly emerging issue.

Sponsored by NPS’ Consortium for Robotics and Unmanned Systems Education and Research (CRUSER), NPS is holding an inaugural xSwarm workshop, March 25-26, to bring together researchers from across diverse fields to provoke conversation about interdisciplinary research and development on xSwarms.

“What we’re really interested in is how you deal with high numbers of agents when you don’t actually know about the swarm itself; hence, the ‘X,’” said Claire Walton, research assistant professor in NPS’ Mechanical and Aerospace Engineering department and one of the workshop’s organizers. “Whether on the fly or through observations beforehand, you’re trying to figure out as much about it as you possibly can and how you might counteract it, given the whole range of possible capabilities.”

The ability to assess xSwarms is becoming increasingly imperative in a world where the enabling technologies of engineered swarms are exponentially expanding ... Fleets of self-driving cars and delivery drones are theorized commercial applications, but it’s not hard to imagine nefarious possibilities in the hands of the adversary.

This poses a host of implications in the present across the military, academia and private industry as autonomous systems scale in size

and capability. Although swarm technology is well understood, very little is known about what to do when confronted with other swarms for which limited or no information exists about their internal control and decision-making mechanisms.

NPS, as a bridge between academia, the military and industry, is the natural place for this event, Walton says. In addition to CRUSER, several interdisciplinary research centers supported by a wide range of academic departments, provide the expertise to respond to advanced technological challenges.

“The xSwarm workshop is a good venue for NPS to demonstrate the potential of its unique role between academia and the DOD,” Walton said. “This is a good way for us to flex that muscle.”

New CRADA Focused on Advanced Space Technologies

NPS and General Atomics Electromagnetic Systems (GA-EMS), provider of aerospace and energy systems to the DOD, finalized a Cooperative Research and Development Agreement, or CRADA, to conduct both classified and unclassified research in the area of advanced space technologies.

The three-year partnership between the university and GA-EMS, which currently supplies electromagnetic aircraft launch and recovery systems and electromagnetic rail gun technology to the U.S. Navy, has the potential to expand into additional technological areas of mutual interest.

Top executives from GA-EMS, including President Scott Forney, visited the university in late 2019 to provide a first-hand introduction on the company’s capabilities to interested students and faculty, and offered insight on available research opportunities made pos-



sible through the CRADA.

“We are really excited to be working with the Naval Postgraduate School and getting this CRADA in place to allow students to come down to our facilities to do their theses,” said Forney. “There are a lot of cool things that we’re going to be doing in the next few years.”

While NPS has entered into several similar types of research agreements with industry partners over the years, the ability to conduct research in the classified space makes the university, and this particular CRADA, a bit unique.

“Once private companies start researching and developing technology for defense applications, there’s a good chance it will become classified,” said Dr. Todd Weatherford, a professor in NPS’ Department of Electrical and Computer Engineering and a key figure in the agreement’s genesis.

“We at NPS have deep technical and academic knowledge ... defense contractors have the engineers ... and our students understand the operational use of the research,” Weatherford continued. “Together, we can guide the research and development of newly-proposed systems, and the flexibility of having different classification levels allows us to explore more application for our research.”

“With that operational knowledge, combined with the engineers, we’re going to produce some very valuable theses,” he added.



NSA Professor Co-Authors Article of the Year

Dr. Mohammed Hafez, a professor in the NPS Department of National Security Affairs, is one of three collaborating authors recognized with the Nils Petter Gleditsch Journal of Peace Research (JPR) Article of the Year Award for 2019. In the piece, "Fratricide in rebel movements," Hafez and his colleagues, Drs. Emily K. Gade and Michael Gabbay at the University of Washington, explore the conditions under which infighting occurs between rebel groups through an analysis of Syrian rebel organizations.

Hafez et. al.'s article provides a clear vision of what conflict and peace scholars can achieve when they leverage innovations in empirical methods and detailed data collection

"I was pleasantly surprised and deeply honored," commented Hafez. "My team and I, who worked on this research for over two years, were just delighted to have our research accepted for publication in this premier journal. To receive the honor of the best paper of the year is just the icing on the cake."



Dr. Mohammed Hafez

of the deadliest conflicts in the world today, and explains why rebel groups lost the fight against the regime of Bashar al-Assad. Hafez's team points to fragmentation and infighting among Syria's numerous rebel factions as part of the explanation.

"The rebels competed with each other during the civil war, thus dividing their ranks and weakening their movement in the face of an existential threat from the government," states Hafez. "This behavior does not appear to be rational to the ordinary person, but we show that the combination of power disparities between the groups, ideological differences among the militant actors, and malign external sponsorship can undermine a rebel movement. We demonstrate these dynamics by looking at patterns of conflict within the rebel movement."

JPR is a peer-reviewed academic journal that publishes scholarly articles and book reviews in the fields of peace and conflict studies, conflict resolution, and international security. Articles were judged on their theoretical contribution, methodological innovation and sophistication and relevance to practical aspects of building peace.

The award-winning article took a look at the Syrian civil war, one

sophistication and relevance to practical aspects of building peace.

NPS Partners with NAVSEA Warfare Centers on S&T Lecture Series

NPS kicked off an all new lecture series in conjunction with research leaders from many of the warfare centers under the Naval Sea Systems Command (NAVSEA), Feb. 26.

NAVSEA's primary objective is to engineer, build and support the U.S. Navy's fleet of ship and combat systems. A significant activity inside NAVSEA is the Warfare Center, which represents 30 percent of the Navy's overall engineering and science expertise.

"It's one of our strategic initiatives in the NPS strategic plan to strengthen our ties to the Navy's Warfare Centers and laboratories," said Dr. Jeff Paduan, NPS Dean of Research. "This is a direct result of that goal, but we

have the long-term goal to have our faculty and students doing more of their research together with the folks in the Navy's laboratory system."

The partnership between NPS and NAVSEA will not only give the



An all-new science and technology focused lecture series kicked off, Feb. 26, as part of a school-wide effort to strengthen the connection between NPS and the Navy's network of warfare centers under the Naval Sea Systems Command (NAVSEA).

students here better real-world experiences and practical knowledge, but it will also allow NPS to access NAVSEA's state of the art laboratories and research facilities.

"We're very fortunate to have a positive response from the leadership of the NAVSEA organization," said Paduan. "The folks at the leadership level of NAVSEA agree that this would be mutually beneficial. The laboratories do not have students like we do.



"We benefit with better access to equipment and facilities, but they get the benefit of working with the students and getting that operational feedback at the beginning," he added.

The lectures will include many of the projects that NAVSEA is already undertaking. Some of the work going on at NPS may directly impact their work and vice versa.

"Doing an academic seminar type series here fits into our culture," said Paduan. "If we get representatives from the labs here, then they have the opportunity to meet our very diverse faculty at NPS. The seminar series itself is a way to introduce each other."

The NAVSEA S&T Lecture Series launched with a "NAVSEA Warfare Center Overview" with Dr. Vittorio Ricci, Chief Technology Officer in the Mechanical and Aerospace Engineering Auditorium.

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FACULTY SHOWCASE

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Menneken Research Award Honors Math, OR Faculty

NPS Provost Dr. Steven R. Lerman announced the recipients of the 2019 Menneken Awards, Dec. 10. Made possible by the NPS Foundation through a grant from the Carl E. and Jessie W. Menneken Foundation, the awards recognize NPS researchers for highly meritorious research with significant impact on the Department of the Navy and Defense.

Associate Professor Jeremy Kozdon from the Department of Applied Mathematics was named recipient of the Menneken Award for Highly Meritorious Research by a Junior Faculty Member, joining Professors Susan Sanchez and Tom Lucas from the Department of Operations Research named joint recipients of the Significant and Sustained Contributions Award.

Kozdon was recognized for his involvement in the development of adaptive numerical methods and

their utilization in high-performance codes running on current and emerging computer architectures. Kozdon is one of the main architects of the computational infrastructure for an ambitious research partnership coined the Climate Modeling Alliance, or CliMA.

“My CliMA research largely focuses on taking numerical methods to simulate the physical world, phenomena like earthquakes, climate and the ocean,” said Kozdon. “What we want to do is build numerical tools that we can use, that we can then hand to engineers and scientists to carry out their research.”

As the sustained contribution award winners, Sanchez and Lucas have spent nearly 20 years on research underpinning advances in how scientists and engineers use high-performance computing to obtain insights from complex models. The duo are the co-founders the Simulation Experiments and Efficient Designs (SEED) Center for Data Farming.



Dr. Jeremy Kozdon, Dr. Susan Sanchez, Dr. Thomas Lucas

“What we’re working on is not a single project, but a whole range of methods,” said Sanchez, “looking at better ways of designing and analyzing simulation experiments. We [want to] keep pushing the envelope in terms of what is possible and what we think the demand is going to be in the future.”

“[To win] is a great honor,” said Lucas. “When you think of all the unbelievable professors that we have, so many contributions around campus, I think it’s really a recognition of our collaboration. Professor Sanchez and I have been doing this for two decades now, [supporting] more than 200

students and their thesis research. And they’re helping us develop methods to apply it too. That really lifts up everything that we do.”

NPS Researchers Explore Impact of Stress on Learning, Performance

Dr. Heather Clifton, a research associate in the NPS Department of Operation Research, is exploring the effects of stress on training and learning retention, with university students, U.S. Navy Lts. Lindsay Clements and Claresse Neill, designing a set of experiments to support the work.

“Research shows that any type

Research Applies Social Network Analysis to Maritime Awareness

In late 2018, a large commercial cargo ship suddenly parked itself under the recently-constructed Crimean Bridge over the Kerch Strait, preventing three Ukrainian Navy vessels from reaching the Sea of Azov port of Mariupol. As they tried to turn back, the ships were intercepted by foreign military forces and captured.

The event sparked international outrage at the time, and has since been viewed as a textbook example of a new generation of hybrid warfare that blurs the lines between military and unconventional conflict.

Around this same time, Norwegian naval officer Cmdr. Stian Schnellez submitted his graduate thesis to the Norwegian Staff College based on work he had completed in cooperation with NPS. He applied a novel maritime network analysis methodology developed by the university’s Common Operational Research Environment (CORE) lab to identify maritime traffic engaged in “gray” activities – commercial vessels sailing under ulterior motives, and potential security concerns.

The concept was a home run, with Schnellez’s thesis receiving the Staff

College’s highest marks. It also garnered immediate attention in the Norwegian Armed Forces, and with leaders in NPS’ CORE Lab and its director, Dr. Wayne Porter, a retired Navy Captain whose ability for disruptive thinking placed him on the staff of Adm Mike Mullen when he served as Chairman of the Joint Chiefs.

“If we commonly use AIS data to track known bad actors anywhere in the world, why not apply SNA to this?” Porter explained. “Ships are big pieces of metal in the water intermittently broadcasting through AIS; if we can track where they are or what they’re doing as an indicator of something we’d be interested in, we can use that to point to who the owner-operator is, what cargoes they’re carrying, what ports they’re frequenting, what other activities they’re conducting, and suddenly we’ve just mapped an entire network, a [potentially] gray maritime network.”

The utility of the concept was immediately recognized, earning the top award in the NATO Communications and Information Agency’s fourth annual industry conference geared towards accelerating transformational technology solutions to NATO’s most pressing issues.

of stress, whether it's a physical stressor or a mental stressor, produces all the same signs in your body," noted Clements. With this premise in mind, research volunteers, separated into multiple groups, were asked to operate a ship simulator. Groups received varying degrees of stress training prior to their first run on the simulator, followed by varying levels of stress applied, from none at all to a cold-water perfusion system on their lower back to having their foot in the ice water during the entire run.

The two variable groups also viewed a stress training video before completing the initial task that instructed them to control their breathing and focus on the performance measures of the ship driving task they were about to perform.

Participants had several vitals monitored during each run, to include blood pressure, heart rate and even electro-dermal activity.

"If we can help to prove the idea of stress training, then someone

can do follow-on work," said Clements "We just hope to improve the quality of our ship drivers."

Clements and Neill cited the two collision incidents of 2017 as a backdrop for their research. Training since has improved, with Sailors learning what to do in emergencies over and over again. But what about training while actually under stress?

"We're taking this very basic concept of inducing stress while training so that if a situation like this happens again, those Sailors can be ready," Clements said.

NPS Researchers Share Expertise at Regional UxS Symposium

The rapidly-growing industry of drones and automation has taken to California's Central Coast. To help drive regional research, development and collaboration, a consortium known as Monterey Bay Drone, Automation and Robotics Technology (DART) held its first symposium this sum-

mer, with researchers from NPS participating in the new effort.

According to Josh Metz, the Economic Development Manager at the Ford Ord Reuse Authority and co-creator of Monterey Bay DART, the goal of the symposium was to take advantage of the area's proximity to educational institutions, Silicon Valley and environmental organizations to drive collaboration on the interrelated technologies involved with drones.

The DART initiative is intended to align industry, academia and government in the Monterey area toward establishing and operating a world-class drone, automation, robotics technology testing and development cluster, said Metz.

"NPS has always valued the research ecosystem formed when industry, academia and the military services unite to innovate novel socio-technical solutions for today's warfighters," said NPS' Robotics and Unmanned Systems Education and Research (CRUSER)

Associate Director Dr. Carl Oros, one of NPS' symposium speakers. "NPS researchers have more than 200 professionally published papers and theses on autonomous vehicles. The relationships NPS has created through this work uniquely positions us to be at the center of all types of autonomous systems activity as Monterey's DART initiative emerges."

"We have a space to do research, development and experimentation at Camp Roberts, and we would also like to do those types of things locally," added Research Associate Marianna Jones. "We want to not only work with industry and academia, but other non-governmental agencies to continue advancing autonomous systems experimentation."

As a broad range of applications for drones on the Monterey Peninsula continues to expand, Monterey Bay DART organizers are already planning next year's symposium to capitalize on the region's unique advantages. **IR**

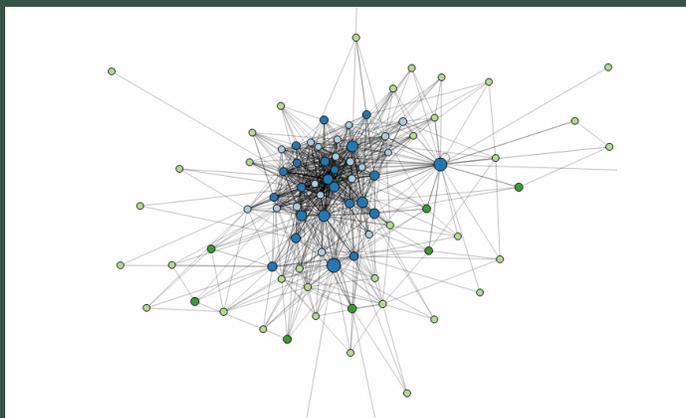
"I was told there were 50 or 60 different entries from 11 different countries, and we won the whole thing," said Frank Brundtland Steder, a principal scientist at the Norwegian Defense Research Establishment (Forsvarets forskningsinstitutt or FFI) who exhibited the project. "Of course, being as diplomatic as possible, I had on my NPS tie, an FFI tie pin and Norwegian Navy cufflinks."

Established at NPS in 2007, the CORE Lab has a long history of applying the analytic methodologies of SNA to the complex problems operators face in the field, from insurgent networks and psychological operations to narcotics trafficking and money laundering. The CORE Lab has generated a diverse range of studies directly advancing the capabilities of the military and government agencies, but they all have one thing in common: they're focused on human networks.

In a new era of Great Power Competition, mapping gray maritime networks to effectively counter fluid threats and adversaries has become increasingly imperative. For Porter, the project's success represents what NPS does best: directly advancing the warfighting capabilities of the United States, and its allies and partners.

"This is a nice feather in our cap because people are starting to recognize

that the operational aspect of what we're doing here isn't just academic," he said. "We're not doing this for academic kudos: the work the CORE Lab has done in SNA, or more accurately, maritime network analysis, is far and away beyond anything that's being done anywhere else, particularly for military operations."



A representation of gray maritime ship networks, developed by NPS' CORE Lab, provides a glimpse into the expansive web of commercial vessels potentially operating under false pretenses.



Four enlisted Marines, part of the newest cadre of NCOs attending the Naval Postgraduate School (NPS), join their officer-student colleagues on the front steps of Herrmann Hall, Nov. 11.

NPS, Marine Corps Advance Graduate Education for Senior NCOs

By MC2 Patrick Dionne

The cohort of senior enlisted Marines enrolled in Naval Postgraduate School (NPS) is growing. Driven by the Department of the Navy's Education for Seapower study, and its recommendations to bolster education among the department's enlisted ranks, NPS and the Marine Corps have opened up graduate education opportunities for senior enlisted non-commissioned officers (NCO).

NPS' Master of Applied Cyber Operations (MACO) program, which has provided Navy enlisted Sailors with graduate degrees since 2012, now educates enlisted Marines to help meet the DOD's growing need for trained cyber professionals. Three Marine NCOs are now enrolled in the 12-month program.

But they're not the only enlisted leaders getting their education on campus ... Joining them are two additional Marines attending

graduate or certificate programs – one for the Foreign Area Staff NCO program, and one in the university's defense analysis department.



The increase of senior Marine NCOs was made possible by the development and release of MARADMIN 709/18, which opens NPS programs to active duty enlisted Marines in the grades of Staff Sergeant through Master Sergeant, with at least seven years of service who have previously obtained a Bachelor's degree.

"Historically, the Marine Corps has not had a program to select NCOs for graduate education in the same way we have had for officers," said NPS Senior Marine Corps Representative Col. Randy Pugh. "Now the Marine Corps is getting more serious about providing advanced education opportunities to enlisted Marines, because 21st century warfare is becoming more technically complex. Our service needs to be prepared, and accurately

reflect the environment that we are going to fight in.

“Educating our force is about capability rather than rank,” Pugh continued. “By getting an education, our Marines can then contextualize it for what they’re expected to do, and although the role of an officer and NCO may be different, they both require the foundational understanding that education provides.”

According to Pugh, the increase in enlisted Marines is a direct result of the Education for Seapower study, which aims to tackle the challenges of a changing technological world through an educated naval force.

“Knowledge is the new currency, and this means we need to educate our force from the most junior person all the way up,” Pugh stressed.

“Another thing that’s happening is we’re blending together commercial and civilian technologies with military technologies,” he continued. “Big data, artificial intelligence and communications technologies that are being created outside the military are being integrated into the military, and having enlisted Marines that receive the same education and credentials as their counterparts on the other side of the fence in the civilian sector gives you a level of legitimacy when you go and interact with the commercial sector.”

Gunnery Sgt. John Lytle, a 14-year veteran who thought his career had stagnated, considered leaving the Marine Corps. Then he came across the MACO program as a “once in a lifetime” opportunity of furthering his education and career.

“I was six years left until retirement looking for the best way to advance myself,” said Lytle. “I viewed [the MACO program] as a way to develop further both intellectually and technically, and so I decided to continue to serve.”

Lytle noted that while general military training provides individuals with the operational capability to do a specific job, graduate programs like MACO benefits the Marine Corps directly because it looks at issues on a broader scale.

“The education goes beyond the technical, and provides opportunities to be exposed to future technologies that you wouldn’t even been aware of otherwise,” said Lytle. “My hope is to take what I learn here and take it back to the fleet and help implement it to help guide us in the right direction on the future of cyber.”

Aside from the MACO program, there are also certificate programs available for enlisted Marines. Take, for example, Master Sgt. Konrad Kleczek, who is attending NPS’ Foreign-Area Staff Non-Commissioned Officer (FASNCO) program in a two-quarter course focusing on security cooperation. FASNCOs are designed to supplement their Foreign

Area Officer counterparts ... The program provides language, regional expertise, and cultural capabilities at the tactical level to improve irregular warfighting and interagency integration.

“When I joined the Marines 20 years ago, a corporal was a corporal, a gunnery sgt. was a gunnery sgt., and a major was a major,” said Kleczek. “But today, with the information and technology available those lines are not as neatly drawn, and any type of educational opportunity for our enlisted services makes us not only more lethal, but also better leaders.”

Staff Sgt. Derek Sharp is in the special operations and Irregular Warfare curriculum, which is part of the Cognitive Raider pathway of MARSOF’s 2030 planning document. Coming from Marine Special Operations Command Force (MARSOC), Sharp just finished his first quarter on the NPS campus.

“Being one of the only enlisted guys here it has been a fantastic opportunity to learn from a great combination of faculty and fellow students,” said Sharp. “I am still in contact with the MARSOF strategy and plans division, who is sponsoring my time here. Through them, I have been looking at thesis topics that would best benefit both myself and MARSOF, as well as be in alignment with the 2030 planning document.”

According to Sharp, the program seeks to identify senior Marine MARSOF personnel still young enough in their career to be able to

utilize unique graduate education in the strategy sphere. Following his time at NPS, Sharp will serve a two-year pay back tour with MARSOF’s strategy and plans division.

Col. Randy Pugh
NPS Senior Marine Corps Representative

“We need smarter, more connected, better informed leaders, and senior enlisted leaders who are a part of that,” said Sharp. “Giving those leaders the same graduate level education helps make them better advisors and decision makers at the command level, and coming here exposes them to that type of thinking.”

Pugh stated this is only the beginning as the Navy and Marine Corps team continues to raise the importance of education across all ranks.

“I would like to see the undergraduate side of the Marine Corps go towards a similar model so that instead of getting training, you’re getting an education and earning credits,” said Pugh. “Then by the time you reach the rank of Staff Sergeant or Gunnery Sergeant you already have your bachelor’s degree. This drastically expands the pool of talent to choose from when bringing in senior enlisted to NPS.”

“While cyber is an obvious one, I would like to see enlisted Marines attending electrical engineering, space systems and even the business school as well,” he continued. “Enlisted Marines in those fields need that level of expertise as well.” **IR**

“The Marine Corps is getting more serious about providing advanced education opportunities to enlisted Marines, because 21st century warfare is becoming more technically complex. Our service needs to be prepared, and accurately reflect the environment that we are going to fight in.”



The Naval Postgraduate School mourned the loss of retired Navy Capt. Wayne P. Hughes with his passing, Dec. 3. A professor of practice in military operations research, Hughes' reputation as a naval strategist was second to none, built through his decades of experience at sea and scholarship on campus — knowledge that he freely passed on to countless naval officers over the years.

In Memoriam: Legendary Strategist and Fleet Tactics Author Wayne P. Hughes

By MC2 Taylor Vencill

The Naval Postgraduate School (NPS) lost one of its most treasured teachers with the passing of retired Navy Capt. Wayne P. Hughes, professor of practice in military operations research and Dean Emeritus of the Graduate School of Operational and Information Sciences ... Hughes passed away on December 3 at the age of 89.

“Wayne Hughes is a national treasure, a man who was dedicated to service, to scholarship, and to educating naval officers and future leaders,” said NPS President retired Vice Adm. Ann Rondeau. “He was a giant among naval strategists, an enormously dedicated teacher and deep patriot of the first order who was both warfighter and scholar.

“He dedicated his life to educating naval officers, and our national defense is stronger because of this man,” she added.

Hughes was a fundamental figure in naval warfare, and influenced how the U.S. Navy conducts naval operations through many of his published works, most notably, “Fleet Tactics and Naval Operations.”

“The best litmus test you can do on the impact that Wayne has had is in the fact that the past seven or eight Chiefs of Naval Operations (CNO) have known him by name,” said Hughes' longtime friend and colleague retired Navy Capt. Jeff Kline, also an NPS Professor of Practice in operations research. “His writing has inspired both tactical and operational thought throughout the fleet.”

When former CNO Adm. John Richardson asked Hughes to write a third edition of “Fleet Tactics,” Hughes gladly obliged. Richardson specifically asked him to include several chapters codifying the importance of information warfare within naval warfare at the operational level.

“When people need a reference for the next 15 to 20 years on information and cyber warfare, they'll pull this book off of the shelf,” said Kline. “The impact he has had is immeasurable ... providing the foundational thought for many of the future discussions on how we shape and employ our forces.”

NPS Kicks Off Seapower Conversations

NPS launched a new video series, Nov. 14, featuring university faculty experts discussing the trends, technologies and tactics that shape modern naval power. Coined “Seapower Conversations,” leadership see the new series as an opportunity to share NPS’ resident expertise with the broader Navy and beyond.

“Your NPS faculty is a diverse group of academics with expertise in topics ranging from machine learning, cyber warfare, autonomy, unmanned systems, quantum mechanics and national strategy, and we hope to share some of that expertise with you,” said NPS President Vice Adm. Retired Dr. Ann Rondeau, as part of an introductory video kicking off the series.

Seapower Conversations kicks off with five episodes in an interview format between faculty associate Lyla Englehorn and lauded strategies and Dean Emeritus retired Navy Capt. Wayne Hughes, who discusses major themes present in the newest edition of his seminal book, “Fleet Tactics and Naval Operations,” co-authored by retired Rear Adm. Robert Girrier.

“The vision for this series is to provide information on the latest research and concepts coming from NPS that will influence the future of naval warfare,” said Professor of Practice retired Navy Capt. Jeff Kline, a key figure behind the effort. “We hope to inspire thought on new concepts and technologies through these videos that will affect the way we fight in the future, and the best way to do that is through the minds of junior and mid-career officers.”



“Whatever we do to memorialize, we have to bear in mind not only his first-class intellect, but also his personal warmth and kindness,” added Good. “We talk a lot in today’s Navy about how we’re supposed to treat each other with respect, but he truly exemplified that. I’ve seen him talking and interacting with a variety of students, and he’s treated them all well, with kindness, dignity and respect.”

While Hughes’ intellect and legacy will continue on for generations, the university proudly featured the iconic strategist discussing the core principles of Fleet Tactics in the inaugural “Seapower Conversations” YouTube series, released last month. In what will be an ongoing effort, Seapower Conversations highlights the expertise of NPS faculty through informal dialogue on the trends, technologies and tactics that shape modern seapower.

And while that common site of Professor Hughes and his smoldering pipe reviewing papers in the Glasgow Hall courtyard may physically not be with us, Hughes legacy as a strategist, a gentleman and a patriot will live on this campus, forever. ■

Hughes was a gifted lifelong teacher, with a rare ability to inspire learning in generations of naval officers. Hughes’ impact has not only influenced the Navy as a whole, but it has left a lasting impression on many of the students and Sailors he has taught and led, many of which are captains and admirals in the fleet today.

“His classroom experiences really had a substantial impact on how his students viewed the way that the Navy worked,” said Dr. Matt Carlyle, Chair of the NPS Department of Operational Research. “He had a deep understanding of how the Navy worked. His teaching style, advisement style, and the way he interacted with everyone he mentored gave them a deeper appreciation for all of the mechanisms of the Navy and the way it operates.”

“He was quick to welcome me to campus when I showed up here and was equally quick to include me, very generously, into his circle of fellow thinkers,” said Navy Capt. Chuck Good, NPS Surface Warfare Chair. “He was very generous with providing people who weren’t on his level with the access to what people on his level were talking about. He was just very generous in allowing those of us here on campus to share in that dialogue.”

Hughes, a 1952 graduate of the U.S. Naval Academy, commanded the minesweeper USS Hummingbird and destroyer USS Morton, and served as Chief of Naval Education and Training Support, Deputy Director of the Systems Analysis Division in the office of the CNO, and was the Executive Assistant to the Undersecretary of the Navy.

“When I first came aboard, I had no Navy background,” said Carlyle. “Captain Hughes was one of those people that every time I sat down with him, I realized I was going to get important information from him. He was a consummate professional.”

Hughes’ knowledge of naval power and tactics, seasoned by many years at sea and even more in scholarship, seemed almost infinite, Carlyle said.

“He didn’t have an opinion without having researched it deeply and understanding how it connected to reality,” he said. “Seeing that, time and time again, really showed me the importance of having that discipline in my thinking, for all of my work.”

Added Kline, one phrase out of Hughes’ work and career will always stand out, “Fire effectively first.”

“I think that single phrase is probably the most quoted part of Wayne’s work,” said Kline. “In fact, that is the ultimate objective of Navy tactical warfare, to ‘fire effectively first.’ I think of anything else, that simple phrase and what it means will probably have the most lasting impact.”

Hughes will not only be missed as a teacher and scholar, colleagues noted. His kindness, generosity and understanding of life seem equally powerful parts of his revered character.

“As a friend, he influenced me more than anything else,” said Kline. “No other man I know personified the order of priority in one’s life to find harmony ... God, family, country and his Navy, and I think he had that in the right order.”

With the release of its 2018 Strategic Plan, the Naval Postgraduate School embarked on a comprehensive effort to advance the effectiveness of teaching and learning across the university campus, just in time for the Navy's deep analysis of education, and the strategic change that has come with it.

By Rebecca Hoag and Dale Kuska

The 21st century security environment has brought to light a fundamental truth now more than ever ... Warfighting is less about physical strength and more about intellect. The Naval Education for Seapower (E4S) Report and subsequent Education for Seapower Strategy 2020 (ESS), released in late February, could not have stated it stronger.

"Today, for the first time in decades, we are competing on a more level playing field and our advantage is declining," the ESS reads in its introduction. "In this new era, the intellectual capability of our Navy and Marine Corps team will be the primary military differentiator between our nation and its adversaries and the true foundation of any credible deterrent to war."

The E4S report and its recommendations laid out a comprehensive framework for how the Navy education system functions, and should function, to ensure Sailors and Marines at all levels are prepared to be as effective warfighters as possible. Some of those changes, like the establishment of the N7 organization and appointment of Chief Learning Officer John Kroger, have already been implemented.

"Unlike a weapons system, we can't just buy a strategically-minded senior non-commissioned officer or field grade staff officer," Kroger said in a recent Navy Live post. "It takes years of education and the right motivation to develop the creativity and critical thinking required to lead through an uncertain future."

In the DON continuum of learning, the Naval Postgraduate School (NPS) is the graduate-level provider of Education for Seapower, providing the interdisciplinary curricula and applied research that leverages students' operational proficiency to help solve key operational problems today, and prepare strategically and technically savvy intellectual warfighters that solve the problems of tomorrow.

Certainly, NPS and the Navy want to provide their Sailors and Marines with the most effective education possible, but what does effective teaching and learning look like? In academia, this has been at the forefront of educators' minds of late. Modern trends, listed by Teach Thought, emphasize the importance of adaptive teaching strategies that reach a diverse set of learners, encouraging innovation and critical thinking, emphasizing the interconnectivity of all topics and student experiences while implementing modern technology.

At NPS, as if the Navy's coming change was written in the stars, the university's strategic plan had already positioned the institution to be capably responsive to this challenge. Led by Dr. Steven Lerman, NPS Provost and Academic Dean, and a committee of forward-leaning faculty representing every corner of campus, the NPS Strategic Plan 2018-2023 prioritized a self-evaluation of teaching and learning effectiveness as a foundational tenet, creating an open network to try new ideas and initiatives to empower an environment where professors are optimally effective, as are learners.

"By being as effective as possible, we can maximize our contribution to the larger goals of the entire Navy, making the entire educational process a learning process," said Lerman. "We can't do all of it, of course, but we have to be as good as possible at the part we are responsible for to ensure we're doing as much as we can to move forward the vision for the Navy, where education is clearly a strategic asset."



The intellectual capability of our Navy and Marine Corps team will be the primary military differentiator between our nation and its adversaries and the true foundation of any credible deterrent to war.

— Education for Seapower Strategy 2020

TRADITIONS AND ALTERNATIVES

Education experts at NPS have studied modern teaching and learning strategies for years, and sought to redefine structures at the school to support a community of practice that improves faculty, staff and student experiences. With so many moving parts at the university, one of the first actions was to create a tangible entity that existed to empower the campus and its people. And the Teaching and Learning Commons (TLC) was born.

Through a determined focus on teaching, learning and technology, the TLC was created, followed by a series of collaborative initiatives and processes, all in support of innovative learning experiences. The driving vision behind the TLC is simple, but clear ... to "stimulate teaching and learning environments that educate the most capable force — wherever they are."

According to Dr. Raluca Gera, Associate Provost for Graduate Education, the TLC began with a simple approach ... listen! Through several open sessions with educators, students and staff on a diverse set of topics, the TLC developed a portfolio of first-year initiatives to begin making a tangible difference in how professors teach, and students learn. Technology mini-grants; innovative, flexible classrooms; and a portfolio of pilot projects, have helped create a campus environment where traditional instructional

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methods are employed and respected, and the exploration of new ideas and alternatives is encouraged.

“The bottom line is we’re listening to you,” said Gera. “Tell us how we can support you to be able to use the classrooms differently than before and how to improve the quality of the education.”

In response to direct input from the NPS community, the TLC has awarded a dozen mini-grants through 2019 in an effort to expand the university’s pedagogical horizons. Supporting a range of innovative ideas from faculty and students, these grants plant the seeds that may grow and spread into more effective ways NPS learns and teaches.

The TLC mini-grants have already covered a broad swath of academic territory, including high-powered rockets, a mind-mapping tool, novel wireless class communications, visual reality goggles and a glass writing board enabling face-to-face communication between professors and students. Awards have varied in type and amount – averaging around \$3,000 – but they all have one thing in common: they can be scaled beyond the requester’s immediate domain to improve the educational experience throughout NPS.

TEACHING REQUIRES LEARNING

While the TLC has created several mechanisms to support educational effectiveness, the people at the heart of a university’s intellectual vitality must be an essential focal point.

Enter the Graduate Education Advancement Center (GEAC) and its Office of Teaching and Learning (OTL), where innovative approaches to faculty development provide a continuum of support throughout the academic career.

In 2018, two competitive fellowship programs were introduced to foster school and departmental learning-focused communities of practice, and to promote and recognize teaching as a scholarly activity – the Teaching Fellows Program (TFP) and the Learning, Education, and Assessment Fellows (LEAF) program – both led by Ali Rodgers, Director of Faculty Development and the OTL.

The Teaching Fellows Program (TFP), sponsored by the Office of the Provost and Academic Dean, engages faculty members from across the schools in a year-long community of practice that leverages experiential and applied learning, readings, seminar discussions, course consultations, personal reflection, coaching, and classroom observations to develop portfolios that expand their teaching repertoires, instructional competencies, and classroom confidence.

“The TFP is a lot of work,” Rodgers says, “but teaching fellows develop, I think, lasting and enduring relationships with people beyond their schools and departments.”

Dr. Judith Hermis, Assistant Professor of Financial Management in the Graduate School of Defense Management, participated in the TFP’s inaugural 2018 cohort. Like many research professors, Hermis was required to teach as a Ph.D. candidate, but never had any formal training on how to teach before becoming a professor.

“I think we all have a growth mindset in terms of our research because we’re doing new research all the time,” Hermis says. “But it’s easy to get stagnant in terms of cultivating your teaching skills. And that’s where I think a program like TFP adds a lot of value because it reminds all of us that we need to put as much dedication into our teaching as we do into other aspects of our jobs.”

While the TFP engages professors at an earlier point in the career,



Dr. Raluca Gera, Associate Provost for Graduate Education, stands in one of four classrooms enhanced with additional educational technologies through a feedback-driven effort to envision future, flexible classrooms, and evaluate their effectiveness in improving the learning experience. The first classes were held in these FLEx Spaces in the Winter Quarter of 2020.

the LEAF program recognizes and supports more senior and tenured faculty who want to facilitate collaboration to address a significant learning challenge within their school or department, or to experiment, develop, pilot and assess innovative educational experiences that enhance learning and achievement.

LEAF projects vary greatly depending on the research and academic priorities of schools and departments. The first two LEAF fellows, selected during Academic Year 2018, were Dr. Alex Bordetsky, Professor of Information Sciences, and Dr. Carolyn Halladay, Senior Lecturer for National Security Affairs (NSA) and the Center for Homeland Defense and Security (CHDS). Bordetsky organized a team to start creating a database of tactical Nuclear Command, Control and Communications (NC3) scenarios for students, so they could practice making realistic, difficult decisions.

Meanwhile, Halladay is in a unique space, actively engaged with both the university's traditional NSA program and its homeland security (HLS) degree. She's working with CHDS program manager Shannon Brown to ensure effective internal communications processes are in place to support her HLS colleagues, advancing the delivery and effectiveness of this unique program.

Faculty for the current academic year have been selected, with NSA Associate Professor Chris Darnton and Applied Mathematics Associate Professor David Canright setting forth on two new efforts.

REDEFINING THE CLASSROOM

With robust programs to support faculty development at all levels, and organizational structures in place to nurture collaborative advancements in effectiveness, the university had also turned its review toward the physical structures supporting the community through the Classroom of the Future (CoF) initiative.

In January 2020, classes are now being taught in what was a direct result of that project. Flexible Learning Experience Spaces, or FLESpaces, are classrooms upgraded through a partnership between the GEAC and the university's Information Technology and Communications Services (ITACS) team. An exhaustive research effort into the latest classroom innovations, detailed surveys with faculty and students, and financial support from the NPS Alumni Association and Foundation provided the building blocks to create truly unique learning spaces, one in each of the university's four schools ... to start. Moveable furniture, glass boards, flat screens and wireless pre-

sentation systems are just a few of the new tech integrated in these select classrooms, all with determined result of improving the student learning experience.

According the D'Marie Bartolf, Coordinator of Education Innovation, the team is now gathering feedback from users on what's working in the FLESpaces,

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and what opportunities for improvement materialize. But one thing is clear, she says, the classrooms “would not have been possible without comprehensive engagements” made possible by the TLC.

PERSONALIZING THE EXPERIENCE

Upon its release in 2018, the NPS strategic plan prioritized teaching and learning effectiveness as a foundational tenet to ensure its officer students receive the highest-quality education possible ... The resulting organizations, expertise and initiatives to support this ideal are progressing. But a university campus is a naturally-inquisitive environment, and NPS wanted to ensure its research enterprise was empowered to independently explore rapidly-developing approaches to learning that are determinately centered on students.

Gera and military assistant professor Army Lt. Col. Michelle Isenhour of the Operations Research department, are researching an up-and-coming, adaptive, online approach to learning called Curated Heuristic Using a Network of Knowledge, or CHUNK, Learning. Supported by the Air Education and Training Command, CHUNK Learning personalizes educational experiences in alignment with a user’s learning style and speed, as well as their foundational knowledge and learning goals.

A student’s self-generated profile information guides how topics are presented, split into four core modules: why the topic matters; how the topic applies to different individuals based on their background; methodology; and, an assessment of the user’s understanding. Within each general topic space, individual CHUNKlets are presented to students in a form best suited for their stated style of learning.

“Students really liked the fact that they had the ability to make the decisions on when they were going to work on CHUNK learning as opposed to being told you’re coming to class for an hour, four days a week and on that fifth day we’ll come for another hour and do a lab,” Isenhour says.

CHUNK Learning is an experimental effort that is also supporting active student research on campus. U.S. Army Capt. John Lucero’s thesis is performing an evaluation to determine CHUNK Learning’s compatibility with Miller’s Law — which, simplified, suggests that humans can only hold about seven items in their short-term memory concurrently — as a basis for how CHUNK Learning sequences content to users.

Lt. Cmdr. Timothy James completed one of Gera’s courses actively using CHUNK Learning, and was impressed by the program’s structure and pacing.

“It’s very flexible for my schedule and allows me to ... stretch [lessons] further on my own and better understand where it is I don’t un-

derstand things,” James said. He noticed that everyone in the class was on the same level of understanding of the material, and he believed that partially had to do with the refresher and complementary materials assigned through CHUNK Learning.

CHUNK Learning will continue to be tested at NPS to determine its benefit, but the faculty involved hope to expand the program’s reach to other DOD institutions in the near future, starting with the Air Force Institute of Technology. CHUNK Learning is also being examined for DOD training purposes, or as a tool for alumni to get refreshed on material they studied at school.

LOOKING AHEAD

With the university’s strategic vision in hand, and the Education for Seapower Strategy 2020 now on the streets, the university remains laser-focused on future initiatives that have the most powerful, far-reaching impact on warfighting and warfighter effectiveness.

One such effort is the TLC’s Distance Learning Quality Initiative (DLQI), originally conceptualized by Dr. Denny Lester, now under the leadership of Ali Rodgers. The DLQI was launched to improve the courses and learning experiences of students enrolled in DL degree or certificate programs.

Students and faculty have spoken, and they want DL courses to be more interactive and engaging, Lester says, which the DLQI plans to address through the development of a robust platform providing training, orientation and time-tested tools and references that give DL faculty as much as possible to master teaching in a DL environment.

“The first year we’re focused on how you ensure quality at the course level, and then next year we want to shift that emphasis to the program and curriculum level,” said Lester. He plans to have a “fellows derivative program” where at least one faculty member from each school can contribute to a comprehensive resource of best DL practices.

The Navy’s Education for Seapower Strategy 2020 presents a clear message to the force — **knowledge creates advantage, to the warfighter and to warfighting.** The sea services have a powerful advantage, with a system of educational institutions providing robust, high-quality programs distinctly focused on the needs of national security.

As the services embark on comprehensive efforts to implement the strategy, within a world rife with uncertainty and peril, education and research institutions must continue their collective contributions to this central ideal, more today than yesterday, and more tomorrow.

For the Naval Postgraduate School, with a detailed strategic plan and vision focused on ensuring programs are as effective as possible, the university is poised to make lasting contributions to Navy warfighting, more today than yesterday, and more tomorrow. **IR**



By being as effective as possible, we can maximize our contribution to the larger goals of the entire Navy, making the entire educational process a learning process.

— *Dr. Steven R. Lerman*
Provost and Academic Dean

SOF Student Theses on Display During Biannual Research Week

By Rebecca Hoag

The Naval Postgraduate School (NPS) Department of Defense Analysis (DA) held its biannual Research Week, Jan. 13-17, on the university campus. Home to a majority of the school's Special Operations Forces (SOF) students, the DA department organizes the event to showcase the unique, far-reaching research efforts underway by its students. In addition, Research Week brings representatives from the broader SOF community to campus for an opportunity to leverage the brain power of students.

U.S. Army Special Operations Command (USASOC), for example, had representatives on hand to provide a brief overview of their research priorities, one of a dozen commands represented. The goal is to get NPS students, like U.S. Army Maj. Chad Tobin, interested in dedicating their theses to research holes the organization wants filled.

Tobin is beginning his third quarter at NPS, and has much of his program's difficult coursework behind him. He's now preparing to dedicate time to his thesis ... His topic of choice is talent management.

"I see a large amount of very qualified officers departing the regiment, and I'd like to pursue what the regiment could do differently," Tobin explains. He is specifically interested in different reward systems that could entice personnel to stay. Like many of the sponsors, USASOC has shown interest in finding ways to keep their best and brightest on active duty.

While several students like Tobin are in search of a thesis topic, DA's Research Week also provides recent graduates, like Army Maj. James Maicke, with a chance to present their research to organizations attending. His thesis, entitled "Tailor-Made Terrorism," conceptualizes personalized terrorism through historical examples. His conclusion offered a possible glimpse into the mind of a personalized terrorist ... how they "select the right personalized tactics to get a large emotional response either out of a population or from an individual that has influential power."

Maicke's research design began with a detailed explanation of what personalized terrorism is, and its potential spread as terrorists become more and more aware of the U.S.'s counterterrorism tactics.

"As time progresses, I think terrorists will certainly adapt due to effective post 9/11 counterterrorism pressure and success," Maicke says. "My thesis also looks into new technologies and the power of mass media, and how they could provide avenues and tactics for personalized terrorism against key leaders in the future."

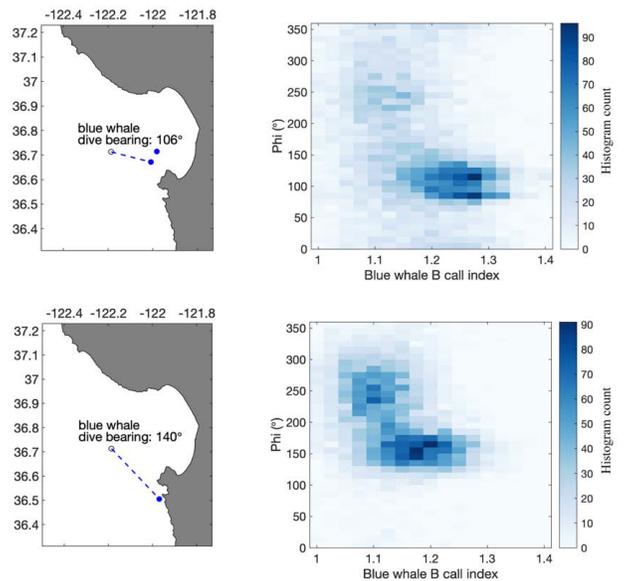
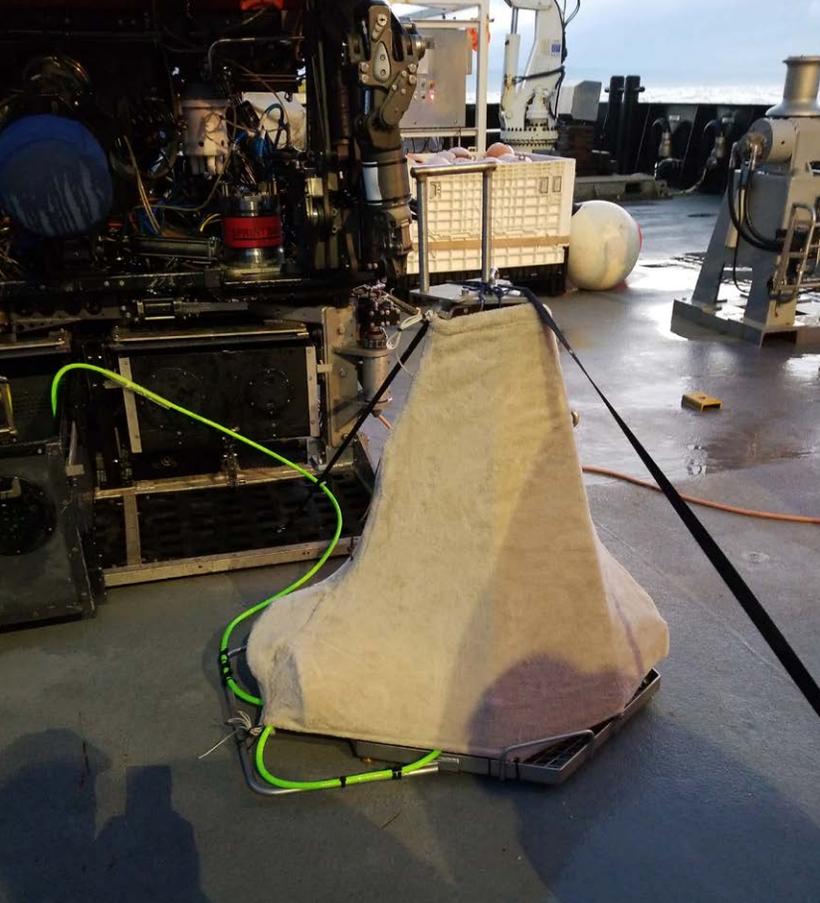
Research sponsorships have traditionally come from within the DOD, but recently, NPS has reached out to private industry. In a first for Research Week, a machine-learning company based in San Francisco, Primer, joined this event. Primer recently established a limited-purpose Cooperative Research and Development Agreement (CRADA) with NPS "to conduct research in mutual areas of interest," according to Wade.

One of Primer's representatives, Director of Primer's National Security Group Brian Raymond, says the partnership gives Primer a chance to "explore some areas that don't fit neatly on the commercial side or the government side.

"What we're really hoping to get is an opportunity to explore with this partnership, and partnership with the students, some of the issues that are relevant to all of us," Raymond says. While Primer was the only representative of the private sector for this latest DA Research Week, the department is open to other interested, relevant companies for future events. **IR**



Army Maj. Philip Riglick explains his thesis to representatives from the U.S. Army Special Operations Command, who came to NPS to listen to the latest in defense analysis research and potentially select or provide research proposals as they seek solutions to specific problems from the field.



Two different blue whale bearing estimates: Left panels show GPS data collected from tags on blue whales relative to MARS location. Right panels provide histogram counts of positive signal to noise (Call Index > 1) recordings coincident with tag data, indicating consistent bearing estimates from acoustic sensor. Note lower level signals around 250 deg bearing are assumed to be generated from off-shore shipping channel. (Analysis and figures by Dr. John Ryan, MBARI)

Covered in a fleece blanket serving as a flow shield, an underwater acoustic vector sensor sits on the deck of a research vessel awaiting deployment in the Monterey Bay in early 2019. The next-generation technology has the capability to provide accurate directionality for tracking a range of targets, from merchant vessels to hostile submarines to marine mammals. (Courtesy photo by Dr. Kevin B. Smith)

NPS Explores Next-Generation Acoustic Detection

By Matthew Schehl

A team of Naval Postgraduate School (NPS) researchers is partnering with local research institutions to explore some of the latest technology in acoustics sensors, investigating a challenge the Navy has struggled with for generations.

NPS Department of Physics Chair Kevin B. Smith, along with Research Associate Paul Leary and Department of Oceanography Research Associate John Joseph are leading a team of researchers to test the next-generation of acoustic vector sensors with the capability to provide accurate directionality for tracking a range of targets, from merchant vessels to hostile submarines to marine mammals.

“Acoustic vector sensors are the latest technology for underwater detection,” Smith noted. “Unlike traditional towed arrays, a single sensor package has the capability to provide bearing estimates [or directionality] in order to better detect, classify or track a signal of interest.

“A single sensor system can say ‘yes, we heard that and it’s coming from that direction,’ so we don’t need a big array anymore to obtain estimates of the bearing,” he added.

Historically, underwater detection has been a bulky and ambigu-

ous endeavor dating back to the first World War, when Navy physicist Harvey Hayes first developed his “Electric Eel” to detect the presence of a submarine up to a whopping two kilometer distance.

Technology truly burgeoned in the early 1960s as the Navy developed a range of sophisticated towed array systems to take on growing Soviet submarine threats throughout the Cold War. Yet many of these systems were handicapped by one serious drawback: as sound waves traversed the water and passed along an array, hydrophones - underwater microphones - could estimate target bearing, but usually with ambiguity in directionality.

“Because the towed arrays are symmetrical, all you are measuring is time difference of arrival along the array,” Smith explained. “You don’t know if something’s coming from 45 degrees that way or 45 degrees the other, whether it’s to port or starboard. You have to maneuver to resolve this ‘left-right ambiguity’, and that takes time.”

Acoustic vector sensors eliminate this ambiguity. Not only do they measure pressure changes in the sound waves as traditional sensors do, but orthogonal accelerometers are able to discern minute changes in the movement of the water itself to directly provide a specific measure of bearing.

This technology is not necessarily new, but size matters when it comes to operational relevance. Over the past few years, enormous strides have been made in vector sensor research, yet devices have tended to be too unwieldy in an environment increasingly defined by speed, size and autonomy.

“The Navy has put directional sensors on submarines before, but they tend to be sort of bigger kinds of things,” Smith said. “Improvements in technology have been made to reduce the size, reduce the frequency response and still get good directionality from the sensors; this has really helped the applications take off over the last 10 years.”

Perfecting small, directional sensors potentially opens broad new horizons for underwater detection and tracking.

Towed arrays outfitted with vector sensors may operate at significantly improved efficiency and accuracy without needing to maneuver a vessel. Tiny sensors may now conceivably be swiftly dipped into the water by a hovering drone, and/or unmanned underwater vehicles (UUVs) may efficiently establish impromptu distributed sensor networks for sensing and tracking or communications.

“A lot of people around the country and around the world are starting to look at this technology and figure it out,” Smith observed. “We can learn a lot from this research in how better to detect, classify or track something, even if it’s marine mammals being detected where the Navy has an ongoing exercise.”

Identifying and tracking marine life is what brought the nearby Monterey Bay Aquarium Research Institute (MBARI) to the table.

Since 1987, the private non-profit oceanographic research center has been a driving global force in bringing technology to bear on important questions in ocean science. Tracking marine migration patterns is an important part of this, and MBARI agreed to host NPS at no cost through a no-cost Cooperative Research and Development Agreement (CRADA) to help refine the technology.

It was MBARI’s research vessel, the Rachel Carson, that helped Smith and the research team deploy the device near the Monterey Bay canyon, one of the largest underwater canyons in the world. With the assistance of a Remotely Operated Vehicle (ROV), the team lowered the unit 891 meters below the surface and connected it to MBARI’s Monterey Accelerated Research System (MARS).

A project managed by MBARI engineer Craig Dawe, MARS is a cabled junction box on the seafloor, capable of providing power and Ethernet to underwater sensors. Originally deployed in 2008 as the first deep-sea cabled observatory offshore the continental U.S., MARS has been supplying NPS continuous data, and should continue doing so for many months before maintenance is required.

“We can use this stationary observatory to detect and track short-range surface craft and possibly submerged vessels,” explained Navy Lt. Benjamin Carpenter, one of Smith’s graduate students that worked on the project to explore its use in mobile systems.

Recording in 30-minute chunks on its resident computer, the acous-

tic vector sensor system streams its data to a server at NPS, where the research team, including naval officer graduate students, analyze it.

“We compare ship tracks against [Autonomous Identification System] AIS data,” said fellow NPS graduate student Lt. Steven Seda. “With vector sensors, we’re able to measure three orthogonal directions - x, y and z - to determine directionality and verify it against the AIS data.”

The underwater acoustic vector sensor results have thus far proven successful, according to Smith.

“We’ve already shown that we can track merchant vessels out in the shipping lane 40 kilometers away from the Big Sur shelf. From this MARS node location, I’m expecting to be able to hear merchant vessels at least 50 if not 100 kilometers away,” he said.

The majority of data, however, has been biological.

“It’s almost nonstop humpback calls!” Smith exclaimed. “The whales are just nice and vocal and always chattering. That was MBARI’s interest in working with us: when they put a hydrophone down, they could hear lots of whales, but they didn’t know from what direction.”

“This capability changes that,” he added. NPS is now providing processed directional data in frequency bands of interest to MBARI researchers to support their studies of marine mammal migrations. Dr. John Ryan, a Senior Research Specialist at MBARI, has recently been able to compare these acoustic results with data collected from sensors placed on blue whales by Dr. Jeremy Goldbogen’s group at Stanford/Hopkins Marine Station. The results are extremely promising (see figures) and suggest that the NPS directional sensor will be able to provide accurate estimates of bearing for a multitude of vocalizing marine mammals passing through the Monterey Bay.

Looking forward, Smith noted there is still much work to do: ensuring processing streams continue to function satisfactorily, making sure algorithms work properly, expanding the sophistication and reach of the sensors, and automating various aspects of the system. Eventually, the research team hopes to use a plurality of sensors to be able to actually identify the location of a target, which would provide a whole new level of capabilities.

In the process, NPS is establishing regional partnerships with other researchers at local institutions and industrial partners, in support of the Naval Postgraduate School’s strategic plan. 3D soundscapes, seasonal variations in ambient sound, geoseismic activity, and other features that can be observed acoustically are providing new insight into activity in the Monterey Bay environment.

“NPS provides the environment where naval officers can be exposed to and actually work with this technology,” he said. “How good is it? What can we get out of it? What can we do with it? We can learn so much from this research, including tracking the migration patterns of marine mammals and beyond.” **IR**



Marine Corps Capt. Jonathan Boron, left, demonstrates an artificial intelligence-based movement planning simulation to Commandant of the Marine Corps Gen. David H. Berger at the Naval Postgraduate School's (NPS) Modeling, Virtual Environments & Simulation (MOVES) Institute, Dec. 5. Berger visited the university to engage with Marines, and get a first-hand view of current and potential future research capabilities.

Commandant Explores Research, Addresses Marines During Visit to Campus

By MC2 Tom Tonthat

Just five months into his tour as the Marine Corps' 38th Commandant, Gen. David H. Berger paid a visit to the Naval Postgraduate School, Dec. 5, to explore relevant research and engage university leadership, faculty and students on future possibilities.

Berger wanted to see the Marine Corps' investment in education first-hand, and to see how student research is addressing critical service challenges. The visit also provided him with a chance to personally interact with the NPS Marines as well as those of the nearby Defense Language Institute Foreign Language Center.

One of Berger's five priority focus areas as outlined in the "Comman-

dant's Planning Guidance" — the strategic direction for the Marine Corps — is education and training. According to the guidance, which places an emphasis on being a successful learning organization able to think, innovate and change, Marine Corps innovation needs to use wargaming, experimentation and modeling & simulation (M&S) to test and refine ideas and concepts, translating them into action — which are key NPS education and research capabilities.

“Combining tactical experience with an NPS education gives these Marines the tools to research and find solutions that have a real-world impact on the Marine Corps today, which is what the Commandant got to see and experience first-hand here at NPS.”

Lt. Col. David Forbell
Deputy Senior Marine Corps Representative

While at NPS, Berger met with university leaders for a roundtable discussion on capabilities and research opportunities, received student thesis briefs on current research directly applicable to current Marine Corps challenges, toured NPS' Modeling, Virtual Environments & Simulation Institute (MOVES),

and concluded the day sharing his service's future plans during NPS' Secretary of the Navy Guest Lecture (SGL) series.

"Your Marine Corps and your naval force are built perfectly for about 1990," said Berger in his SGL address. "If there were another Desert Shield or Desert Storm, which I was in, we're built for it. But we're not optimized today for gray zone competition that's below the threshold of war or open conflict against our pacing threats.

"Add to that the fact that China, Russia and Iran have watched us operate on the playing field for the last 20 years, and they've learned a lot about how we operate," he continued. "As they stretch their naval forces, we need to make some foundational changes to our force to undertake a new way of fighting. The foundation of our strategy must be deterrence, and deterrence in the future maritime environment — the counter and stabilizer — is a strong naval expeditionary force."

While he has a plan for where the Marine Corps needs to go in the future, Berger said, the solutions on how to get there come from the bottom up.

"You're here to study, thinking about the product, process and solutions we need," said Berger. "None of us know when or where the next conflict will be, but someday you may get the call to go someplace you may not be prepared to go. We need you at the next level, so I challenge you to put your nose to the grindstone so you'll have enough built up here to face something head-on later."

Exploring many of those future solutions through student research, NPS Marine Corps students are key players in the development of those "bottom up" solutions.

"Our Marine students are very familiar with the challenges and problems that Marines in the fleet are facing today," said Deputy Senior Marine Corps Representative Lt. Col. David Forbell. "Combining tactical experience with an NPS education gives these Marines the tools to research and find solutions that have a real-world impact on the Marine Corps today, which is what the Commandant got to see and experience first-hand here at NPS."

Berger's tour of the MOVES Institute, which the Marine Corps has sponsored since 2015, demonstrated a small piece of that cutting-edge research with direct impact back to the fleet. Virtual reality simulations that more accurately evaluate differences in human behavior, especially in application to wargaming scenarios, was just one of several student project reviewed.

"One of the great things about NPS is how graduates who have been in the fleet, and have observed problems, can reach back to bring up those problems for the faculty and students to work on," said MOVES Institute Director Dr. Imre Balogh.

Following the MOVES tour, Berger listened to additional student research briefs on topics such as the One-China Policy, predictive

success in officer training programs, and the analytics of enhanced lethality and marksmanship.

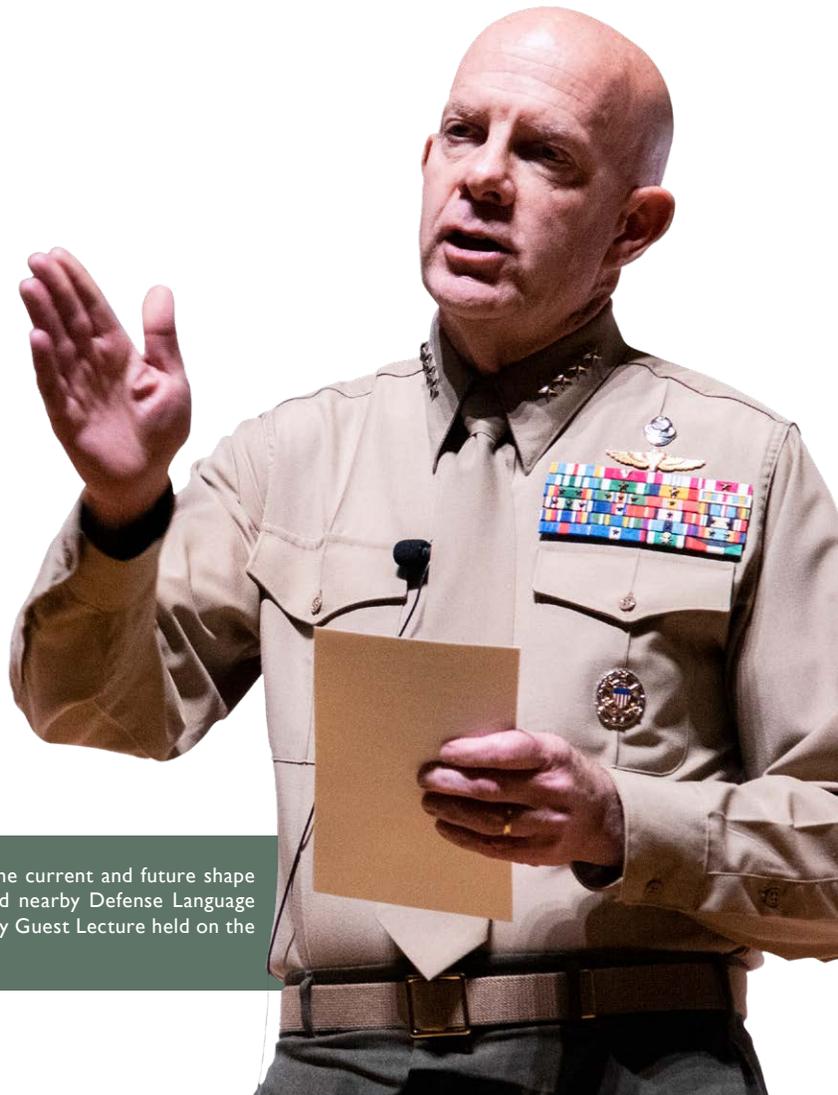
"One of the challenges we have as a Marine Corps is, when a student finishes his or her research project, the knowledge they have gained, or the solution they have evaluated, needs to get back into the hands of the Marine Corps organization or fleet unit who needs it so they can potentially apply it," said Forbell.

With one of the Commandant's focus areas being education, Forbell continued, this is a critical step in maximizing the value of the Marine Corps' investment in these students, and in NPS.

Berger's feedback on the feasibility and potential application of each thesis brief encouraged the students to continue their work. Berger later expressed his appreciation and thanks to the Marines in helping him understand what NPS is all about.

"Thank you for helping me understand what this place is all about and what I need to do to support it," said Berger. "[Our] biggest weapon system is right between your ears, and this year, you're adding to it.

"Chances are, sometime during your career, you will be in a unit that gets the call to go ... That's when all of it comes together. This year is your prep time. Fill your mind so when you see something later on, you'll have enough built up there to know you've seen something similar," he continued. "Let's go, let's move, and don't hesitate, because Marines do not hesitate. I am very proud to serve in your ranks." IR



Commandant of the Marine Corps Gen. David H. Berger talks about the current and future shape of the force to Marines studying at the Naval Postgraduate School and nearby Defense Language Institute Foreign Language Center during his latest Secretary of the Navy Guest Lecture held on the university campus, Dec. 5.



U.S. Army Gen. Richard D. Clarke, Commander, U.S. Special Operations Command (USSOCOM), visits the Naval Postgraduate School and engages with NPS student U.S. Army Maj. Trisha E. Wyman following her thesis brief titled, "Social Media and Strategic Nuclear Weapons: The Russian Case," Jan. 23.

USSOCOM Commander Explores NPS with Emphasis on Partnerships

By MC2 Nathan K. Serpico

During a recent trip to the West Coast, U.S. Army Gen. Richard D. Clarke, Commander, U.S. Special Operations Command (USSOCOM), paid a visit to the Naval Postgraduate School (NPS), Jan. 23, to explore relevant research and engage with students on a first-hand look at how NPS is fostering innovation.

Clarke wanted to gain a better understanding of not just how NPS research is addressing critical challenges, but also how the university is specifically preparing professionals in special operations forces (SOF) to innovate in the modern environment. Clarke also participated in NPS' Secretary of the Navy Guest Lecture series, where he spoke about the history and mission of USSOCOM and how partnering with academia and industry will help to give America the edge.

"My guidance and priorities from the Secretary of Defense and from the national defense strategy are clear," said Clarke during his address.

"Thinking about the future, and helping the force become predictive is why I'm spending time in places like NPS," said Clarke. "We at SOCOM want to be a pathfinder for you in this area because at the end

of the day, we still have men and women that are forward deployed and need the best capabilities and the best protection, and that's why I'm here - because we have to innovate for the future."

Core to the university's mission, NPS has recently worked to expand and develop new education and research partnerships with the private sector, government sector and academia to foster defense-relevant research and capabilities. Clarke linked academia and industry as a combined key enabler that can inform and shape how the force thinks about the future.

"I absolutely believe in education, and we have to work with academia and technology companies to get the best and brightest minds to help the defense industry," he said.

According to U.S. Army Col. John Crisafulli, NPS' Chair for Special Operations, the visit allowed for a two-fold understanding between Clarke and NPS.

"This visit enabled [Clarke] to see the entire realm of NPS and what it has to offer the SOF community," said Crisafulli. "We [at NPS] produce

in SOF professionals what SOCOM has directed them to have. This visit allowed him to understand our curricula which helps SOF professionals understand innovation in the modern environment, and it helped us elicit guidance from him. If SOCOM needs more specific classes to focus on emerging needs, then we, unlike other institutions, have the flexibility to make those changes.”

In the concluding remarks of his address to faculty and students, Clarke

talked about leadership and delivered several personal anecdotes regarding failure and success, which boiled down to one phrase — “trust your gut.”

“There will be times in your career where you will have to make decisions, and at the time you may not realize how consequential they will be,” said Clarke. “Follow that gut instinct, and know that experience comes over time. Don’t be afraid to use other people and ask for their input because that is absolutely critical.” **IR**

GSDM Professor Awarded Prestigious Grant to Research Optimal Parental Support Policies

By Matthew Schehl

Dr. Jennifer Heissel, assistant professor of manpower and economics in the Graduate School of Defense Management (GSDM), has been awarded a prestigious Robert Wood Johnson Foundation Evidence for Action (E4A) grant to pursue research into the effects of DOD parental support policies for service members — research that has the potential to shape the health and well-being of military families, and the American public, for generations to come.

Drawing on titanic collections of DOD data, Heissel will take a deep dive into how different policies — maternity and paternity leave as well as subsidized child care — relate to parents’ health in the active duty population.

“We’re just trying to find causal ‘X leads to Y’ evidence to demonstrate how we can improve health in the military,” Heissel said. “For example, when you give parents more leave, are they able to go to doctors’ appointments to keep their own health up? Or are they better able to support their spouse who is back at home?”

The different military branches have, at different times, had different parental support policies in place. Over the years, they’ve collected massive amounts of data on service members: physical fitness tests, medical records, substance abuse trends, mental health screenings, vitals at physicals and health-related duty limitations.

The E4A grant will enable Heissel and her team to utilize this wealth of information, anonymously aggregated, to conduct statistical analysis and evaluate a range of policies — six versus 12 versus 18 weeks of maternity leave, for example — with a higher degree of fidelity than is possible outside the DOD.

“You can’t really do these policy evaluations in the civilian world in the United States; rarely do you have that kind of data access,” Heissel noted. “For instance, we can see if rates of maternal depression change across those different [military] policy regimes, or we can see if rates of other health outcomes changed along those same time frames at precisely the times when these new policies were coming into play.”

Heissel is quick to point out, however, that she isn’t going it alone. Her crack research team, comprised of NPS graduate student Marine Corps Capt. Mike Healey and Northwestern University graduate stu-

dent Olivia Healy, provides invaluable assistance slogging through the behemoth amounts of data. NPS faculty have a definitive role as well.

“It was my fantastic colleague Yu-Chu [Shen, GSDM associate dean of research], who originally recommended that I apply to the grant,” Heissel said. “I have felt very supported.”

“This grant reflects well on what we are able to do at NPS; we have top quality researchers doing interesting and important work,” she added. “It’s nice to be recognized by the Robert Wood Johnson Foundation for the unique contributions that we can have towards policy improvement and health.” **IR**



Dr. Jennifer Heissel has been awarded a prestigious grant from the Robert Wood Johnson Foundation’s Evidence for Action program to pursue research into optimal DOD parental support policies.



Students selected for Naval Postgraduate School's inaugural Meyer Scholar program join NPS President retired Vice Adm. Ann Rondeau, front row left, outside Herrmann Hall, Nov. 19. The Meyer Scholar program is an initiative started at NPS to develop officers well-educated in the disciplines associated with integrated air and missile defense.

Meyer Scholar Program Develops Air and Missile Defense Experts

By MC2 Tom Tonthat

Responding to current challenges in air and missile defense, the Naval Postgraduate School (NPS) has initiated the Meyer Scholar program, named for the 'Father of the AEGIS Combat System,' retired Navy Rear Adm. Wayne E. Meyer.

The objective of the Meyer Scholar program is to develop officers who are well-educated in the science and engineering disciplines associated with Integrated Air and Missile Defense (IAMD). The program selects current NPS students and focuses their academic courses and research projects toward the technical and operational challenges of IAMD.

"In the integrated air and missile defense mission, nations ranging from underdeveloped to great power are rapidly advancing in air and missile capabilities," said retired Navy Capt. John Hammerer, the NPS IAMD Chair. "Because this threat is developing and proliferating so rapidly, there is an urgent need for officers who are both technically competent and operationally focused to lead efforts to develop and employ IAMD capabilities to defend the United States, its deployed forces, allies, and friends."

A selection committee comprised of Warfare Chairs and Program Officers selected six Navy officers and one Marine Corps officer to be members of the program's inaugural class, based on their previous operational experience, academic work, and vision of how they would focus their studies while at NPS. The students are pursuing varied majors, including phys-

ics, electronic systems engineering, systems engineering and operations research, and will direct thesis research toward IAMD topics.

Meyer, the program's namesake and an NPS Distinguished Alumnus and Hall of Fame member, became known as the Father of AEGIS after having been the first program manager of the AEGIS Shipbuilding Project. Meyer's vision for performance and reliability in air and missile defense systems resulted in the design, production, test, and life cycle support of over 100 U.S. Navy and allied AEGIS ships and ashore systems.

Meyer Scholar Lt. Justin Williamson, who has devoted his career to the maintenance and operation of the AEGIS Combat System, believes the combination of his operational experience and NPS education will lead to compelling thesis work.

"Meyer Scholar collaborations and our future thesis work are going to be exciting because of what they could lead to," he said. "I believe we all will contribute to the advancement of naval strategy, tactics and Admiral Meyer's vision of the integrated combat system."

"Being a Meyer Scholar gives us the opportunity to present our thesis topics to key IAMD leaders," added Lt. Erick Samayoa. "The Meyer program gives us the opportunity to pursue research projects that will help bring promising technology to the fleet and return to the Fleet as officers who understand the intricacies and challenges of Integrated Air Missile Defense."

The Meyer Scholar Program is now working on integrating the NPS educational experience with material development and operational training, including an initiative is to develop a continuum of NPS education and Surface Warfare Tactics Instructor (WTI) training.

“The decisive advantage at sea will likely go to the power with officers who are better educated, critical thinkers who have mastered the intricacies of their combat systems,” said Hammerer. “The Meyer Scholar program is doing its part to produce those officers.” **IR**

Crew Endurance Team Explores Innovative Sleep Solutions

By the NPS Crew Endurance Team and Rebecca Hoag

The Naval Postgraduate School (NPS) Crew Endurance team, whose research has already led to fleet-wide changes in watchbill rotations to provide more sleep to Sailors, has now focused their studies on the quality of that sleep. The team recently embarked onboard the guided-missile destroyer USS Paul Hamilton (DDG 60) to study innovative changes to Sailor work centers and berthing compartments, and their potential impact on crew health and performance.

Led by Dr. Nita Shattuck, the Crew Endurance Team has long touted the importance of sleep ... they’ve monitored the sleep schedules of Sailors for over a decade, demonstrating how optimized schedules improve the health, performance and readiness of the Navy warfighter.

Now, the team is working to develop enhanced rack curtains for berthing compartments that reduce light, minimize temperature fluctuations, increase privacy and reduce noise levels, all with the goal of improving sleep quality.

“We have been studying crews on underway U.S. Navy ships since 2002,” said Shattuck. “We have developed some great relationships with several ship commands who have encouraged us to try out our ideas on their crews. Getting underway with the ships and experiencing the same challenges that the Sailors face gives us the credibility needed to do underway studies that can lead to positive change for Sailors and increase their effectiveness.”

While underway, the team installed 300 pairs of the newly designed rack curtains, replacing the standard-issue curtains that are currently used on almost all Navy surface combatants. These new curtains, in addition to being made from thicker and heavier government-approved fabric, can be laundered and have interior pockets that provide convenient storage for the crewmember. The pockets also contain magnets to reduce movement at the bottom of the curtain, ensuring additional privacy and further reducing light from outside the rack.

In order to measure the effects of the intervention, 50 crewmembers of varying rank and specialization, and in differing berthing arrangements across various ship locations, volunteered to participate and wear “sleep watches” for the

three-week study period. The NPS team will compare the quality of sleep received by Sailors while using the old and new curtains.

In addition, light and temperature monitors have been installed inside and outside of the participants’ racks to quantify any changes in environmental conditions. And finally, participants will fill out questionnaires to provide feedback on their experiences with both the old and new rack curtains.

“It is amazing to see how much progress the Navy has made toward improving crew endurance,” says Shattuck. “The surface force continues to be forward-leaning, permitting us to try out schedules and new methods that may help optimize Sailor effectiveness, increase alertness and reduce fatigue levels. These new curtains bring us one step closer to meeting the goal of well-rested Sailors performing at their optimal levels.”

Shattuck anticipates the results of the team’s latest study to be ready later this year. Meanwhile, the Crew Endurance Team continues to look at other tactics and innovative solutions to optimizing crewmember rest so Sailors are better able to respond to the challenges posed by an increasingly complex world. **IR**



Sailors onboard USS Paul Hamilton participate in the NPS Crew Endurance Team’s latest study assessing the impact of innovative rack curtains on sleep quality. Over a three-week period, Sailors will use a ‘sleep watch’ and fill out questionnaires about their experience comparing standard issue curtains versus new versions that reduce light, noise and temperature change.



A cohort of 30 Army Acquisition Corps officers is the first to graduate from NPS' new curriculum 522 in Systems Engineering Management. Developed with direct input from senior Army acquisition leaders, the modified curriculum represents a critical shift in advanced acquisition education.

Army Grad Turns to NPS to Advance Education for Acquisition Pros

By John T. Dillard, Senior Lecturer, Dept. of Systems Engineering

On Dec. 20, the first cohort of 30 Army Acquisition Corps Officers graduated from a new curriculum, called 522, at NPS with a Master of Science degree in Systems Engineering Management. In addition, most of those graduates will have completed their Joint Professional Military Education (JPME) and Army intermediate-level education at the Naval War College's Monterey satellite campus.

Over the course of their graduate studies at NPS, students receive 34 different Defense Acquisition University course equivalencies as a concurrent benefit that saves them valuable time away from the acquisition work that needs to be done.

Those 30 officers can credit their new systems engineering management degrees to Lt. Gen Paul Ostrowski, the Principal Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(AL&T)) and NPS President, retired Vice Adm. Ann Rondeau, who sought for and steered the changes to the NPS curriculum in Army acquisition.

It was a big ask. And Ostrowski wasn't the first to request a technological upgrade to the program. Starting in 2011, three successive principal military deputies to the ASA(AL&T) had asked for more STEM in the systems acquisition management curricula at NPS, which has been sponsored by the Army since 1991. But it was Lt. Gen. Paul Ostrowski who really pushed for it to come about in 2017, collaborating closely with Rondeau.

Despite pushing for the technological upgrade to the NPS graduate education, Ostrowski said it was Rondeau and her faculty who were the real change agents. It took some heavy lifting by the systems engineering faculty and the proponent office of the U.S. Army Acquisition Support Center as well. Several iterations of combined courses were staffed and modified for optimal composition and sequencing. It was a great example of how the relationship between the university and a curriculum sponsor can partner to tailor the advanced education programs at NPS.

Ostrowski is a 1996 alumnus of NPS, and a former student of mine.

JOHN T. DILLARD, COL., USA (RET.), managed major weapons development efforts for most of his 26-year career in the U.S. Army. He is now a senior lecturer in the Systems Engineering Department of the Graduate School of Engineering and Applied Sciences at the U.S. Naval Postgraduate School in Monterey, California, where he also serves as the technical representative for the Army's new Master of Science programs in Systems Engineering Management.

As we discussed proposed changes, he told me, “We have to recalibrate our graduate education at NPS.” He wanted NPS to focus more on product than process, emphasizing new capabilities over policies.

“We need more technical, less managerial. Our folks already know how to lead people. What they really have to manage in the acquisition arena is complexity,” he said. Recent studies of military capacity to execute national security and defense strategies showed a shrinking technological edge over our near-peer threats.

Realizing there weren’t many officers in the ranks with highly technical or engineering undergraduate degrees, the Army’s academic advisors at NPS observed that specialized degrees like engineering management were the fastest growing graduate education segments in the USA.

Also, the Government Accountability Office specifically cited a lack of systems engineering in many high-profile weapon system program failures. Large program cancellations of the past ten years included Future Combat System (\$18.1B), Comanche (\$7.9B) and Crusader (\$2.2B). Everything pointed to a need for more skills in the areas of systems engineering as well as the acquisition essentials of contracting, program management, and test and evaluation. A long-standing degree at NPS was the Systems Engineering Management degree for folks without an engineering undergraduate degree. With that as our foundation, we could easily integrate courses from across the campus.

MORE THAN BUSINESS AS USUAL

Over the next year, the NPS Department of Systems Engineering assembled the needed courses and faculty members to modernize and satisfy our sponsor’s shifting educational needs. With a palpable sense of urgency coming from the Pentagon and global challenges on the horizon, the Army’s 18-month master’s degree program at NPS reorganized to provide Level III Defense Acquisition Workforce Improvement Act (DAWIA) training equivalencies in three different disciplines: systems engineering, program management and contract management; with Level II in test and evaluation.

Ostrowski often says of the new programs, “This is what right looks like!” and added, “President Rondeau understands our current national security environment and helped us forge the path to meeting our new educational requirements.”

Since the first cohort, he has sent three additional groups of Army Acquisition Corps officers, arriving twice per year. There’ll be two more groups coming in January and June 2020, so even with the departure of this first large cohort, there’ll be around 80 officers on the ground in Monterey. That’s the biggest Army Acquisition footprint ever seen at NPS.

BIGGER AND BETTER

NPS leadership not only welcomed the changes Ostrowski requested, but also helped build a correlated distance learning program, curriculum 722, and awarding the same degree, for the Army’s multifunctional career field civilians in acquisition. As a part-time, 24-month degree program, it delivers DAWIA Level III certified training equivalencies in program management and systems engineering, along with Level II in test and evaluation and contracting fundamentals. More than 40 AAC civilians have already enrolled in that program, being centrally selected by the Office of the Army Director of Acquisition Career Management

(DACM) within the U.S. Army Acquisition Support Center.

One of the striking aspects of both the resident and distance learning programs is the Capstone Thesis Project — and how it differs from a traditional master’s thesis. Projects are selected by the Army and other services, who “sponsor” the five-person student teams as they solve real-world problems with a time-phased, systems engineering approach. A pair of faculty project advisors is assigned to each five-person team to coach them through the six-month process of architecting solutions. In the end, the clients, the Systems Engineering department faculty and all of the other AAC students are briefed by each team on their project results.

Another NPS graduate, Lt. Gen. L. Neil Thurgood, director for hypersonics, directed energy, space and rapid acquisition and director of the Rapid Capabilities and Critical Technologies Office, visited NPS last June, and gave one of our six student teams their Capstone Thesis Project: to find an affordable radar that can be mounted on a ground combat vehicle and track targets on the move. This study directly supports what his team is doing at Redstone Arsenal to demonstrate a directed energy weapon system mounted on a Stryker combat vehicle in 2021. His message to our 62 assembled AAC officers was that the new 522 program was going to be extremely advantageous for them, because of their resulting qualifications to serve in either 51A and 51C assignments. Another high-achieving alumnus, he advised them that diversity of knowledge is often more important in acquisition than depth in any single field.

The other five teams conducted their capstone projects studying topics such as: multiple concepts of operations for swarms of unmanned aerial systems; an acquisition value model for SOF materiel, an analysis of contracting transactions in deployed vs. garrison environments; and, prioritizing Army Community Services funds allocation; and field experimentation of the Soldier-Borne Sensor for optimal display size.

The Soldier-Borne sensor team won the competition for Systems Engineering Management Outstanding Capstone Project.

CONCLUSION

The latest investment by the Army at NPS is the establishment of a new military position on the faculty, the Systems Engineering and Army Acquisition Chair, to help administer the Army’s programs and oversee them for the military deputy and DACM. Col. Joyce B. Stewart will be the first in the position, arriving in April of 2020. Coming from the Army’s Office of the Chief Systems Engineer and a seasoned program manager. COL Stewart will bring Army relevance and current perspectives from her recent experiences. Welcomed by President Rondeau as an NPS asset, she will help us move into the next decade, in support of all Army acquisition students at the school.

Overall, the new 522 and 722 degree programs deliver what Army leadership asked for: more technological relevance in an era of increasing threats, with students actually using the tools they’ve acquired before they leave for their follow-on acquisition assignments. Qualified to serve in a larger variety of assignments than ever before, our graduates are going to be able to contribute to warfighting readiness in the newest technological fields. They’ll be well-equipped to equip the warfighters.

For more information on these new Systems Engineering Management programs, visit the NPS Department of Systems Engineering website. 



NPS student Lt. Meagan Way captures an image of a La Mesa family on their home's front steps through her participation in the Front Steps Project, a grassroots effort gone viral that started in the Boston area to help connect families and neighbors sheltered in place while combating the COVID-19 pandemic.

NPS Student Helps Connect Military Families With Her Camera

By Javier Chagoya

Unprecedented shelter in place orders and social distancing, albeit for good reason, are tough, especially for military families eager to get to know their communities and neighbors.

Naval Postgraduate School (NPS) student Lt. Meagan Way felt the distance between her and her neighbors first-hand. When a friend told her about a viral grassroots effort near Boston to foster connections within a community through photographs, she knew exactly what to do.

"I love doing things in my community! I'm an NPS student, but outside of class, I love to volunteer," said Way. "I have a friend who mentioned the Front Steps Project and I knew it would be a hit around here."

Way reached out to families through Social Media and her connections to NPS clubs residing in military communities across the Peninsula, including Doe Park, Fitch Park, La Mesa and Hayes Park. At a designated time, the families gather on their front porch, and Way with camera in hand captures the moment.

The portraits are posted on a Social Media space dedicated to military families in the area, providing an opportunity for these small communities to get to know each other a little better. And she added her own unique

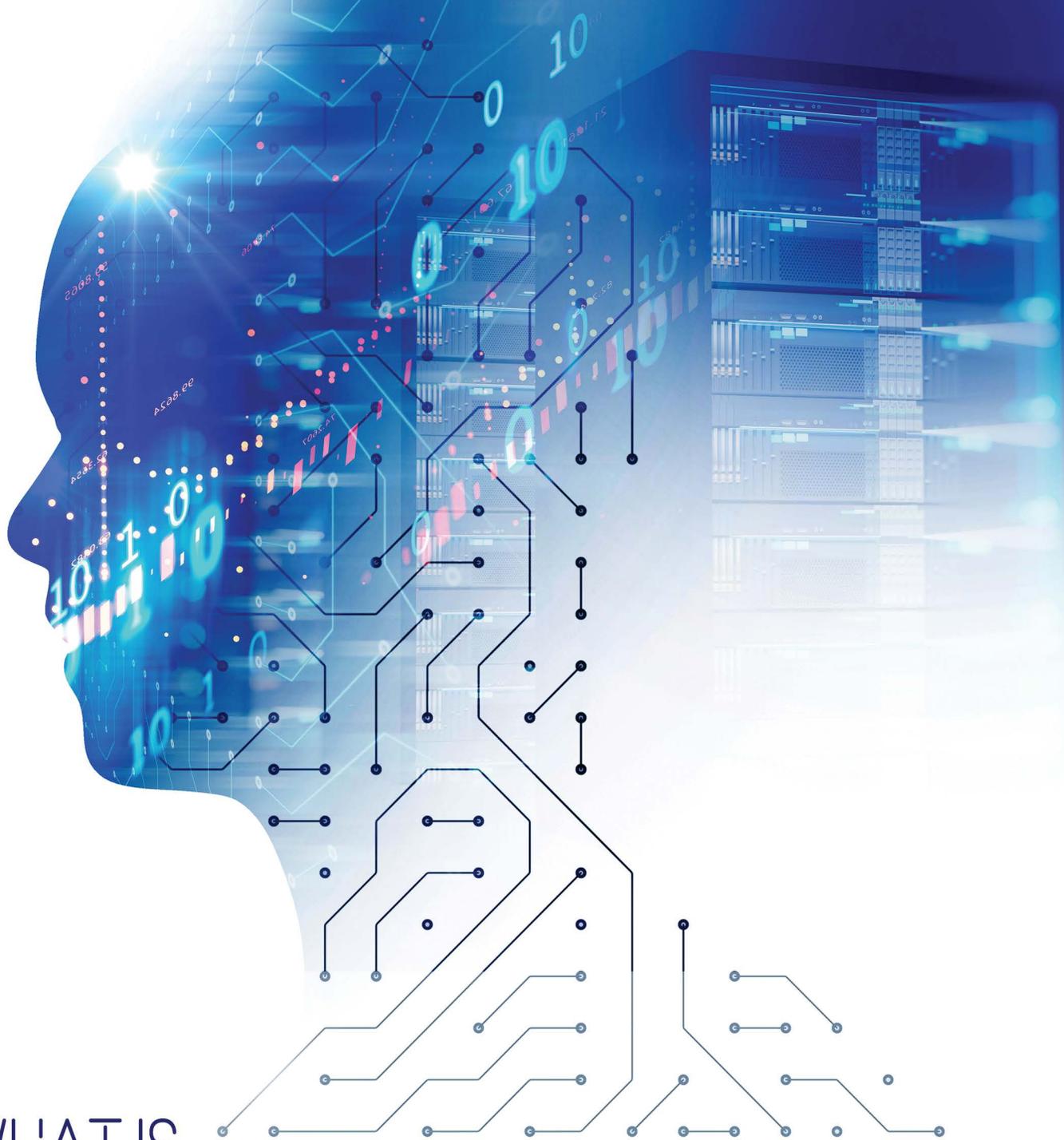
spin on the project by giving each family a copy of the portrait she takes.

At the end of the day, Way has captured a view of each of these families, at least 40 of them at last count, at one of the most unprecedented, challenging times in our nation's history.

"The purpose of these photos is to bring a little bit of fun and sunshine into this dreary COVID-19 situation," said Way. "I want to bring neighbors together and show that we are all in this together!"

Way is enrolled in the university's Network Operations and Technology curriculum, with just two quarters remaining until graduation. She was commissioned through the Officer Candidate School program. Originally from Munford, Tenn., she attended the University of Memphis where she received a Bachelor of Science in Biology.

Way came to NPS from VAQ-132 where she served as the automated data processing systems officer and security manager, including a collateral duty as the public affairs officer. She volunteers several hours a week at the Monterey Military Attic, a non-profit thrift store where donated items are free to military and DOD members. She is also a volunteer member of NPS' Del Monte Brass. **IR**



WHAT IS ARTIFICIAL INTELLIGENCE?

Between hype and hearsay, AI is broadly considered the next game-changing technology for the defense sector and beyond. But the AI Literacy Gap is real, and a lack of fundamental knowledge about the technology clouds its potential.

NPS' Harnessing Artificial Intelligence Lecture Series was created to close the AI Literacy Gap, providing a series of lectures from campus experts on varied aspects of Artificial Intelligence, from automation to ethics to security.

Check it out on the NPS YouTube Channel: [youtube.com/NPSvideo](https://www.youtube.com/NPSvideo)



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With the unfortunate cancellation of the Winter Quarter Graduation ceremony due to the pandemic, university President retired Vice Adm. Ann Rondeau took a moment to recognize this quarter's Center for Homeland Defense and Security (CHDS) graduates via teleconference, most of whom had to take a moment of their own from the front lines of the national COVID-19 fight.

Although the break was brief, Rondeau thanked the new NPS alumni for finishing their program in a virtual environment,

and encouraged them to continue using the advanced education and professional networks they've just obtained to share best practices, collaborate and win the fight.

They heeded the advice. Near the onset, CHDS has organized weekly teleconference meetings open to all program graduates in the heat of the pandemic, sharing best practices, assisting in coordination, and simply, connecting.

Across campus, like many of our university peers, we transitioned every program possible to distance learning with less than a few weeks to prepare. By the end of the first week of the Spring Quarter, we had held 1,233 technology-enabled classes to 13,743 total participants.

In time, the Coronavirus will no longer be novel, and our students will return to campus to study, to research, and perhaps most importantly, to build those same invaluable connections that have made us so strong.

Critically Connecting

The onset of the novel Coronavirus pandemic besieged the nation — truthfully the world — as the decade turned to 2020. Unpredictable. Unyielding. And yet, unexpected in its ability to demonstrate what is best about, us.

As a species, humans are connected, globally and individually. The virus would not have been so tragically effective without it. But as we created new terms and implemented tactics, like social distancing and sheltering in place, we found new ways to champion the very same vulnerability the Coronavirus exploited ... We connected.

Here at NPS, we connected across the nation, and world, with purpose and mission.

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