



# NPS IN THE NEWS

## Weekly Media Report –Dec. 8-14, 2020

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### RESEARCH:

#### 1. [Monterey’s Naval Postgraduate School Commissions New War Institute](#)

*(Monterey Herald 14 Dec 20) ... Dennis Taylor*

The Naval Postgraduate School on Friday commissioned a new institute geared specifically to pull together a number of technological and operational disciplines to address what it is calling the “great power competition.”

The Hughes Naval Warfare Studies Institute’s mission is to “coordinate NPS inter-disciplinary research and education to accelerate and enhance warfare concepts and capability development while preparing students for future conflict.”

#### 2. [NPS Researchers Developing the Defensive Playbook Against Large-Scale Drone Swarms](#)

*(NPS.edu 11 Dec 20)*

*(EurekaAlert! 11 Dec 20)*

*(Navy.mil 11 Dec 20) ... Rebecca Hoag*

The 2018 Winter Olympics in PyeongChang, South Korea stunned the world when they put on a dazzling light show made up of a record-breaking 1,218 drones, all dancing in harmony. In the Department of Defense (DOD), though, the display reinvigorated interest in counter-swarm tactics research, for drones and swarming tactics can have applications in all warfighting domains.

#### 3. [NPS Annual Workshop Goes Mostly Virtual, Seeks to Prepare Military for Future Conflicts](#)

*(SEAPOW 8 Dec 20) ... Edward Lundquist*

The Warfare Innovation Continuum (WIC) at the Naval Postgraduate School (NPS) in Monterey, California, conducts an annual workshop to better understand a major issue that will be the subject of study for the year to follow.

In 2020, the school examined “Resurrecting War Plan Blue,” which refers to an examination conducted by the War Department between the first and second world wars about the nation’s ability to support and sustain a major conflict.

#### 4. [NPS Creating Virtual Undersea Environments to Advance Underwater Autonomy](#)

*(NPS.edu 9 Dec 20)*

*(Navy.mil 9 Dec 20) ... Mass Communication Specialist 2<sup>nd</sup> Class Tom Tonthat*

With undersea warfare remaining a key domain for U.S. defense strategies, the ability to map and navigate the depths of the world’s oceans becomes increasingly essential to maintaining an advantage. Responsive to the Navy’s emerging technological needs, the Naval Postgraduate School (NPS) is partnering with private academia to do exactly that – develop a virtual undersea environment to assist with the research and development of autonomous underwater vehicles (AUV) so they can conduct marine mapping of the world’s oceans.



## 5. [New Advantage in Undersea Warfare](#)

*(Israel Homeland Security 13 Dec 20)*

The ocean is a challenging environment. The ability to map and navigate the depths of the world's oceans becomes increasingly essential to maintaining an advantage in undersea warfare. A new development effort will provide the US Defense Department and academic organizations authentic virtual environments for developing and evaluating autonomous systems, specifically ocean robotics systems.

Responsive to the US Navy's emerging technological needs, the Naval Postgraduate School (NPS) is partnering with private academia to develop a virtual undersea environment to assist with the research and development of autonomous underwater vehicles (AUV) so they can conduct marine mapping of the world's oceans. NPS researchers and Woods Hole Oceanographic Institution (WHOI) will deliver real-world naval solutions in the form of new underwater autonomous capabilities.

## VISITS:

### 6. [Marine Corps Assistant Commandant Explores Emerging Concepts, Capabilities at NPS](#)

*(NPS.edu 11 Dec 20)*

*(Navy.mil 11 Dec 20)*

*(Marines.mil 11 Dec 20)* ... Mass Communication Specialist 2<sup>nd</sup> Class Tom Tonthat

On a trip to observe emerging technologies in practice, Assistant Commandant of the Marine Corps (ACMC) Gen. Gary Thomas, accompanied by five other general officers, visited the Naval Postgraduate School (NPS), Dec. 9, to engage directly with university faculty and students from key labs and institutes about the implications of their research on future concepts and capabilities for the Marine Corps.

## EDUCATION:

### 7. [SMWDC Graduates Seven New Amphibious Warfare Tactics Instructors](#)

*(DVIDS 4 Dec 20)*

Seven Warfare Tactics Instructor (WTI) candidates completed the Amphibious Warfare (AMW) WTI qualification course on December 4, and joined the growing team of Naval Surface and Mine Warfighting Development Center (SMWDC) WTIs across the Surface Force... After earning qualification, WTIs complete a production tour, where they bring their skills to bear by providing advanced tactical training, developing tactics and doctrine, providing operational support, and crafting capability assessments. A pilot program at **Naval Postgraduate School (NPS)** is taking four fleet WTIs and giving them academic theory behind those tactics to make them even better warfighters; the program expects to double next year. SMWDC values the education officers receive at NPS, and this new program shortens certain curriculums allowing WTIs to obtain an accelerated master's degree without the lengthy in-residence requirement.

## FACULTY:

### 8. [‘These Mountains Could Turn into Jelly.’ Above Santa Cruz, Residents Fear Devastating Mudslides](#)

*(Los Angeles Times 8 Dec 20)* ... Susanne Rust

The fire that rampaged through the San Lorenzo Valley in August and September burned hotter and destroyed more acreage than anyone in these rugged, rural and breathtaking mountains can remember... “If there’s one thing you need to know about the people who live in the Santa Cruz Mountains,” said Mark Stone, the area’s state assemblyman and a former tech industry attorney and professor at the Naval Postgraduate School, “they are resilient.”

## ALUMNI:

### 9. [Coloradans Matthew Dominick, Jessica Watkins Selected to NASA’s Artemis Team](#)

*(CBS Denver 11 Dec 20)* ... Ben Warwick

Two Coloradans will play a pivotal role in returning humans to the moon. NASA introduced the Artemis Team on Wednesday, and two Colorado natives are on the list.

Lieutenant Commander Matthew Dominick, a Naval Postgraduate School alumnus, and Dr. Jessica Watkins were selected to the team. Dominick hails from Wheat Ridge, while Watkins is from Lafayette.



10. [A Submarine Officer and a Handful of Military Pilots are in the Running to be the First Woman to Walk on the Moon](#)

(*Business Insider India 11 Dec 20*) ... Ryan Pickrell

The National Aeronautics and Space Administration (NASA) announced Wednesday the names 18 astronauts who could return to the moon as part of the Artemis program, a new lunar exploration program... Born in Germany, Moghbeli is a major in the US Marine Corps. She holds a bachelor's degree in aerospace engineering with information technology from the Massachusetts Institute of Technology. **She also has a master's degree in aerospace engineering from the Naval Postgraduate School.**

**UPCOMING NEWS & EVENTS:**

**December 18:** [Fall Quarter Graduation](#)

**December 25:** Christmas Day

**January 1:** New Year's Day



## RESEARCH:

### Monterey's Naval Postgraduate School Commissions New War Institute

*(Monterey Herald 14 Dec 20) ... Dennis Taylor*

The Naval Postgraduate School on Friday commissioned a new institute geared specifically to pull together a number of technological and operational disciplines to address what it is calling the “great power competition.”

The Hughes Naval Warfare Studies Institute’s mission is to “coordinate NPS inter-disciplinary research and education to accelerate and enhance warfare concepts and capability development while preparing students for future conflict.”

The idea of the institute is to provide Navy and Marine Corps groups that have complex operational problems or perceived warfighting gaps access to 600 technical experts and students with operational experience, said retired Navy Capt. Jeff Kline, the director of the institute.

“This is an institution that can call on help from different people in different domains, different warfare chairs, different faculty and students to address key operational problems,” Kline said.

NPS refers to a “Great Power Competition” that realistically includes three nations: the U.S., China and Russia. The Navy says the Hughes Naval Warfare Studies Institute is critical in retaining a technological and tactical edge to prevail in potential future conflicts where adversaries increasingly threaten the Navy’s control of the seas.

For example, a new concept the institute could help direct is called “distributed maritime operations” that would enable a force that is capable of winning a fleet-on-fleet engagement with both manned and unmanned systems the use of deceptive tactics and the strengthening of units to conduct offensive strikes.

The institute is named after retired Capt. Wayne Hughes, who died last year. Hughes was known for his published works, notably “Fleet Tactics and Naval Operations” first published in 1986. It is considered a key resource for naval officers to study battle planning and tactical thinking, the Navy said.

Hughes, who was also a professor at NPS, was also known for his advocacy of smaller boats or drones — what the Navy likes to call “smaller weapons-carrying platforms.” These smaller boats can be thought of as newer cousins to the “swift boats” used in tactical operations in Vietnam.

Their modern versions are still in the concept phase, the Navy said.

<https://www.montereyherald.com/2020/12/14/montereys-naval-postgraduate-school-commissions-new-war-institute/>

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### NPS Researchers Developing the Defensive Playbook Against Large-Scale Drone Swarms

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*(Navy.mil 11 Dec 20) ... Rebecca Hoag*

The 2018 Winter Olympics in PyeongChang, South Korea stunned the world when they put on a dazzling light show made up of a record-breaking 1,218 drones, all dancing in harmony. In the Department of Defense (DOD), though, the display reinvigorated interest in counter-swarm tactics research, for drones and swarming tactics can have applications in all warfighting domains.

Through funding provided by the DOD to the Naval Postgraduate School (NPS), Professors Isaac Kaminer and Abe Clark will lead the development of a counter-swarming analysis toolbox. The program is supported by NPS’ Consortium for Robotics and Unmanned Systems Education and Research (CRUSER), a group that responds directly to Fleet and Force research needs. This effort builds upon previous research funded by the Office of Naval Research (ONR) Science of Autonomy program. It enables Kaminer’s group to establish a multi-university, multi-year effort to develop an operational planning simulation for defense against an attacking drone swarm.



“We’re looking for mathematical representation or frameworks that we can use to model these scenarios as accurately as possible,” Kaminer explains.

Their project involves partnering with the Marine Corps Systems Command (MCSC), the Program Executive Office (PEO) Land Systems and Ground-Based Air Defense (G-BAD) to add input regarding real-world threats.

Kaminer, who teaches in the Mechanical and Aerospace Engineering (MAE) Department, has dedicated the last ten years to the study of uncertain parameter optimal control, a mathematical theory that provides an analytical foundation for studying swarm-on-swarm engagements.

Clark, who teaches in the Physics Department, is newer to this project. He specializes in soft matter, which looks at how systems made up of many solid objects interact with each other (think a pile of sand where each individual grain pushes on its neighbors). To model how all these objects behave collectively, Clark and colleagues in the soft matter field use discrete-element method (DEM) simulations. In these simulations, it sometimes takes a long time for the computer to determine the interaction between every grain of sand.

Similarly, a swarm is a group of individuals that work in-sync to achieve the same goal, but it can be made up of dozens or thousands of individual agents that are interacting with each other. Most swarming tactics nowadays involve autonomous vehicles (AV) and artificial intelligence (AI), but swarming is also conducted by manned vehicles. Several countries have already developed the technology to attack through drone swarms that can be shot out of ground-based or underwater launching systems into the air. NPS’ own Advanced Robotic Systems Engineering Laboratory (ARSENL) has conducted a great deal of drone research and experimentation, including setting a record years ago for launching and flying 50 UAVs simultaneously.

Swarms can be directed by either following one leader or multiple, and the leader(s) can be physically there or virtual. And slowly, the commands are becoming more advanced and able to adapt to changes. There’s also different types of flying patterns and different weapon possibilities.

With so many variables to consider, no prediction software packages currently available can keep up because it can take a while to go through all the possible avenues for every agent to take. Kaminer and Clark have joined with several other NPS and academic colleagues – Drs. Wei Kang, Johannes Royset and Sean Kragelund at NPS; Dr. Claire Walton at the University of Texas at San Antonio (UTSA); and Dr. Qi Gong from UC Santa Cruz – to find mathematical representations of all the different scenarios.

Clark brought his expertise in making simulations faster and more efficient. Kang and Gong, who teach in the math departments of their respective universities, help provide the theoretical backbone for these algorithms. Gong designs algorithms for large-scale optimization and Kang brings his expertise in the mathematical theory of Observability, which looks at how well internal workings of a system can be determined by one’s understanding of external observations of the system’s behavior.

“You can see velocity and location and based on what you can infer where the leader is and what coordination strategy they follow,” Kang explains.

Royset, who teaches in the Operations Research (OR) Department, brings his understanding of random and deterministic optimization, or how resources can be used most effectively in cases of random or pre-programmed agents. In addition, Walton and Kragelund bring more experience and understanding of the theory of optimal control, like Kaminer.

Kragelund, a research professor in the MAE department, has years of experience building and programming the kind of autonomous machines swarms might use. He and Kaminer are involved in the NPS Center for Autonomous Vehicle Research (CAVR). Walton, who spent the last five years researching in CAVR, is now setting up an additional lab for the team to use at UTSA, which will provide a testbed for swarm experiments of hundreds of robots. Recent NPS graduate Theodoros Tsatsanifos also contributed extensively to this work through his passion and master’s thesis work.

The team will use the optimization protocols to build a “playbook” of best tactics for different kinds of scenarios. They have adapted the mathematical theory of optimal control to include uncertainty, meaning they are allowing room for the unknowns while still providing feedback to officers for decision-making.



“We want to make a framework that can model any particular kind of drone with any particular kind of weapons capabilities and also have some other ground-based weapons included,” Clark explains. “Then we can hopefully just change a few lines of code, and we can still push play on the whole framework.”

This requires a combination of deterministic nature of algorithms that tells drones what to do and randomness, which comes from not fully knowing what the enemy drones will do. The math also must take into account the nature of attrition – agents dying – and how drones should adjust to that new reality.

“It’s really hard to know how to defend when you’re faced with a large-scale adversarial swarm attack,” Kaminer says.

But that’s where the team’s algorithms can help test the validity of current off-the-shelf simulators and inform leaders in the field of how best to address an adversarial drone strike.

Their algorithms so far are showing promise, but there’s a lot of work to be done. The team was going to hold a workshop on this topic last March, but that got shut down due to the pandemic. They hope they can hold one next March. The team has also been approached by a global venture business firm to apply algorithms already produced to real-world systems.

As demonstrated by the NPS innovation ecosystem of researchers, fleet partnerships and operationally-experienced students, this project has fully utilized the different intellectual and interdisciplinary facets of NPS to work towards a unified goal ... Advancing concepts to capabilities for an increasingly complex maritime battlespace.

<https://nps.edu/-/nps-researchers-developing-the-defensive-playbook-against-large-scale-drone-swarms>  
[https://www.eurekalert.org/pub\\_releases/2020-12/nps-nrd121120.php](https://www.eurekalert.org/pub_releases/2020-12/nps-nrd121120.php)  
<https://www.navy.mil/Press-Office/News-Stories/Article/2444574/defending-against-large-drone-swarms-is-focus-of-playbook-from-naval-postgradua/>

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## **NPS Annual Workshop Goes Mostly Virtual, Seeks to Prepare Military for Future Conflicts**

*(SEAPOWER 15 Dec 20)* ... Edward Lundquist

The Warfare Innovation Continuum (WIC) at the Naval Postgraduate School (NPS) in Monterey, California, conducts an annual workshop to better understand a major issue that will be the subject of study for the year to follow.

In 2020, the school examined “Resurrecting War Plan Blue,” which refers to an examination conducted by the War Department between the first and second world wars about the nation’s ability to support and sustain a major conflict.

The September 2020 Workshop, the 13<sup>th</sup> in the series, tasked participants to consider a conflict scenario in the year 2035 requiring the U.S. to quickly mobilize forces and assets in response to a rapidly deteriorating global security environment.

The three-and-a-half-day experience allowed NPS students focused interaction with faculty, staff, fleet officers, and guest engineers from Navy labs, system commands and industry. The workshop tasked participants to apply emerging technologies to shape the way we fight in a 2035 global conflict. Concept generation teams were given a design challenge: How might emerging technologies and concepts and joint, combined and coalition forces contribute to enhancing the resiliency of naval forces, logistics, and support facilities in an extended campaign against a peer adversary?

The intent was to explore technologies and policies to undertake now to increase the nation’s resiliency for an extended conflict.

The 2020 WIC workshop included 157 registered participants in the roles of concept generation team members, facilitators, panelists, mentors and observers. The full participant pool included representatives from 72 different organizations, most participating virtually. Half of the workshop participants were NPS



students drawn from all naval warfare domains, as well as from the full range of armed services on campus.

Prof. Jeff Kline, Director of the Naval Warfare Studies Institute and Professor of Practice in Operations Research, said the proposed topics each year were narrowed down by employing selection criteria.

“Is the concept feasible, either physically or fiscally; is the concept unique; does the concept solve a key problem or fill a key gap; and is the concept testable?” he asked.

The issues examined for War Plan Blue are relevant today, Kline said. “We want to investigate our vulnerabilities in mobilization and industrialization, and potentially in our ability to operate forward with our infrastructure as it currently exists.”

“Our junior officers are focused on their course of study at NPS, and early career engineers at the labs or with industry are focused on their particular project work ... mixing them together in this way to work within these problem spaces is a really rich environment to not only explore what’s in the realm of the possible, but understand what that exploration can be.

“We want our own students to have an appreciation for operational challenges that are going to be emerging over the next 10 years, and [we are] teaching them how to do critical thinking to find solutions for them.”

### **Trending topics**

In addition to supplying topics for further NPS research, past WIC Workshops have informed senior leadership and provided information and concept ideas to Naval Warfare Development Command (NWDC) and the Marine Corps Warfighting Lab (MCWL). The September 2017 workshop tasked participants to apply emerging “Distributed Maritime Operations” technologies within a near-future conflict in an urban littoral environment, and the 2018 “Cross Domain Operations” workshop looked at integration of assets. The September 2019 workshop “Logistics in Contested Environments” asked teams to focus on how to maintain forces in a sustained conflict.

Kline said the workshop brings together a mix of faculty and students with the field, fleet, academia and industry.

“We examine the issues, and take the best ideas to inspire research and prototyping for the whole academic year. By taking on these topics suggested by senior leadership, and by socializing the results with our stakeholders, we are maintaining NPS as a thought leader, both in emerging technologies and developing concepts,” Kline said.

“Our officer students bring the tactical operational experience of this environment, and they walk away with a broadened experience in order to be able to tackle the unknown in the future,” Kline said. “We also hope to build informal networks among the junior engineers of the nation and the operating naval officers here at NPS and those that participate, so that they start to maintain contact across both industry and the services to know how to find some of these solutions to complex problems.”

NPS students have completed several tours of duty before coming to Monterey. “They have tactical experience, and they have operational experience, although not at a senior level,” said another facilitator, Matt Largent, head of forecasting, assessment and transition at Naval Information Warfare Center Atlantic in Charleston, South Carolina. “This workshop invites them to be part of the higher-level conversation.”

Another facilitator, retired Marine Col. Todd Lyons, vice president for the NPS Alumni Association and Foundation, said the workshop was as much about problem framing as problem solving.

Prof. Lyla Englehorn was the workshop facilitator.

“My biggest goal in any of these workshops is to introduce a new toolbox to approach a complex problem space — what we call ‘wicked problems,’” she said. “You can’t propose a solution or solve a problem until you understand the status quo.”

“When we present these emerging technologies in this forum, it gives our concept generation team members a sense of what’s just outside of the box, what’s the adjacent possible,” she said. “We hear



‘thinking outside the box’ all the time. But stand on the edge of that box, what can you touch? What’s within the potential 2035 time-frame?”

Following panel discussions and presentations from leading technical experts, the teams and their embedded facilitators had seven hours of scheduled concept generation time to meet that challenge, and presented their best concepts on the final morning of the workshop.

According to Englehorn, this applied approach ensures that NPS provides defense-focused graduate education, including classified studies and interdisciplinary research, to advance the operational effectiveness, technological leadership and warfighting advantage of the naval service.

### **Avoiding Cost, Time, Jetlag**

While the coronavirus presented challenges, there were also opportunities. The COVID-19 pandemic pushed all resident work at the Monterey campus to a remote environment, so WIC workshop became a mostly virtual affair.

Englehorn said in spite of the pandemic, the workshop was able to include a greater breadth of participants around the world this year.

“We broadened our participation quite extensively. Technology allowed us to do that. We had students participating remotely from Singapore and Romania, and a U.S. Marine Corps officer who is on an exchange program at the Colombian Naval Academy.”

The NPS Virtual Campus employs a combination of remote learning tools, including Microsoft Teams for plenary session and concept generation team breakout rooms. The NPS distance learning platform, Sakai, supported all materials for the workshop which allowed for participants to review materials in advance, reference them throughout the workshop as well after the results have been posted. The teams also used the MURAL3 collaboration tool for concept generation work in an unclassified remote environment.

“We normally conduct this as a resident activity. Most of the teams were working at unclassified levels because of the way we executed the event. However, one team of select NPS students was able to gather in person on campus (following strict COVID 19 protocols) working on technologies related to informational warfare at the classified level. They brainstormed the old-fashioned way, with whiteboards, Post-it notes and Sharpies,” Englehorn said.

Even if Covid-19 restrictions are removed next year, Englehorn said NPS may keep some of its newly learned best practices.

“Having hybrid events using these online tools allows us to involve many more people working on these problems,” he said. “We’re not looking at the ‘new normal,’ but the ‘new next.’”

<https://seapowermagazine.org/nps-annual-workshop-goes-mostly-virtual-seeks-to-prepare-military-for-future-conflicts/>

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## **NPS Creating Virtual Undersea Environments to Advance Underwater Autonomy**

*(NPS.edu 9 Dec 20)*

*(Navy.mil 9 Dec 20)* ... Mass Communication Specialist 2<sup>nd</sup> Class Tom Tonthat

With undersea warfare remaining a key domain for U.S. defense strategies, the ability to map and navigate the depths of the world’s oceans becomes increasingly essential to maintaining an advantage. Responsive to the Navy’s emerging technological needs, the Naval Postgraduate School (NPS) is partnering with private academia to do exactly that – develop a virtual undersea environment to assist with the research and development of autonomous underwater vehicles (AUV) so they can conduct marine mapping of the world’s oceans.

Partnering with the Woods Hole Oceanographic Institution (WHOI) – a private, nonprofit research and higher education organization dedicated to the study of marine science and engineering – NPS is capitalizing on its interdisciplinary curricula and innovative faculty and students. Through the partnership



with WHOI and its relevant expertise, NPS researchers will deliver real-world naval solutions in the form of new underwater autonomous capabilities.

“The general area of this research is to provide authentic virtual environments for developing and evaluating autonomous systems, specifically ocean robotics systems,” said Associate Professor Brian Bingham, Director of NPS’ Consortium for Robotics and Unmanned Systems Education and Research (CRUSER). “We’re trying to create these virtual environments for a variety of underwater meteorology and oceanography platforms, as well as autonomous underwater vehicles (AUVs), to test their operations and be able to develop the autonomous software before doing real-world tests.”

According to Dr. Michael McCarrin, Research Associate in the NPS Department of Computer Science, reliable mapping has only recently become widely available for land applications which has greatly modernized land-based transportation.

“Almost everything is made easier and more efficient if you have a good map,” said McCarrin. “The ocean is a challenging environment, and our reach using current technologies is relatively limited, even assuming an unlimited budget. As AUV technologies improve, the hope is that we will both extend our [mapping] capabilities while simultaneously reducing risk to human operators.”

For WHOI, partnering with NPS to create a virtual undersea environment can be used as a testbed for AUVs under development. For a virtual undersea map to be a reality, it will be autonomous systems that are exploring the ocean depths, and at lesser risk and expense than their manned counterparts.

“It’s about us recognizing opportunities to help our defense department and academic partners to create these kinds of solutions and innovations,” said Bingham. “Our stakeholders rely on us for domain expertise, and we rely on them for setting priorities ... that creates a partnership.”

According to Bingham, NPS’ undersea environment will also help the university’s other partners to test their AUVs for any potential issues before taking the actual vehicle into the water.

“One thing we say a lot is, ‘If it doesn’t work in simulation, it’s not going to work in the field,’” said Bingham. “Let’s solve all the problems in simulation that we can because it’s very inexpensive, especially during COVID where we can telework to adjust the simulation. Then we can be more productive when we go into the field.”

Bingham and McCarrin credit NPS’ relationships and collaborative efforts with others in private industry and academia for the shared resources that should ultimately lead to a successful virtual undersea environment, and ultimately better autonomous systems.

“Because of our position as an academic institution and a [Department of Navy] entity, combined with our close proximity to Silicon Valley, we are in a good position to facilitate collaborative projects that bring to bear a lot of expertise,” said McCarrin. “We often have developers and leading research organizations working closely with NPS students and researchers.”

As for Bingham, he noted there are some really hard problems in the maritime domain involving autonomy and robotics, including getting people to think beyond the mainstream.

“We’re trying to create an environment that would attract our students to think about careers in these areas and realize autonomy is not just self-driving cars,” said Bingham. “For our NPS students, they’re getting to work with industry engineers to create the playing field, to come up with the physical environment simulation and infrastructure that will lead to interoperability between NPS, industry, even other Department of Defense agencies, that will live beyond them.”

<https://nps.edu/-/nps-creating-virtual-undersea-environments-to-advance-underwater-autonomy>  
<https://www.navy.mil/Press-Office/News-Stories/Article/2441422/naval-postgraduate-school-creating-virtual-undersea-environments-to-advance-und/>

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## **New Advantage in Undersea Warfare**

*(Israel Homeland Security 13 Dec 20)*

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The virtual environments are designed for a variety of underwater platforms, to test their operations and be able to develop the autonomous software before doing real-world tests.

"As AUV technologies improve, the hope is that we will both extend our [mapping] capabilities while simultaneously reducing risk to human operators," according to the researchers.

For WHOI, partnering with NPS to create a virtual undersea environment can be used as a testbed for AUVs under development. For a virtual undersea map to be a reality, it will be autonomous systems that are exploring the ocean depths, and at lesser risk and expense than their manned counterparts, as reported by [dvidshub.net](http://dvidshub.net).

<https://i-hls.com/archives/105675>

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## **VISITS:**

### **Marine Corps Assistant Commandant Explores Emerging Concepts, Capabilities at NPS**

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On a trip to observe emerging technologies in practice, Assistant Commandant of the Marine Corps (ACMC) Gen. Gary Thomas, accompanied by five other general officers, visited the Naval Postgraduate School (NPS), Dec. 9, to engage directly with university faculty and students from key labs and institutes about the implications of their research on future concepts and capabilities for the Marine Corps.

The visit to NPS was part Thomas' West Coast innovation trip which allowed him and other senior leaders – including the Deputy Commandant of Information Lt. Gen. Loretta Reynolds and Assistant Deputy Commandant for Combat Development and Integration Maj. Gen. Kevin Liams – to see firsthand how organizations are leveraging technological advances in innovative ways that hold promise for the future force of the Marine Corps.

The key focus at NPS was to examine advances within the information environment including cyber, space, machine learning, artificial intelligence and data analytics.

Investing in research and education, the Marine Corps sends more than 150 students a year to NPS to work on key operational Marine Corps challenges. Therefore, nearly 40 Marine Corps students from all four of NPS' graduate schools had the chance to engage with Thomas and the cohort of senior leaders, presenting their research and getting feedback from the highest levels of Marine Corps leadership about how their research could be implemented.

"We greatly value the education that is made available here [at NPS] because it makes us better as a warfighting organization," Thomas told the students. "We greatly appreciate a lot of the hard work that goes into your efforts as you complete your degree programs. How can we make the master's program even better? It's about making sure that we are aligning and leveraging the work that you are doing here."



During the presentations, NPS student Marine Corps Capt. Molly Dundon described her thesis, “Information Warfare in the High-End Fight.” Thomas immediately acknowledged the relevance of her research due to information being a high priority focus area within Great Power Competition.

“It’s a unique thing to the Marine Corps to be able to do such high-level research here with so many professionals,” said Dundon. “Getting such direct feedback helps us capitalize our time to make [our time] here most beneficial to the Marine Corps so we can make a big impact.”

According to Col. Randy Pugh, NPS Senior Marine Corps Representative, the USMC is looking at new capabilities and has a host of questions, all of which should be answered by people who have an excellent grasp on military operations, significant technical expertise, and critical thinking abilities.

“All NPS students have this rare combination,” Pugh said. “And when it combines with our world-class operationally-focused faculty, we have the ability to generate literally hundreds of studies or other kinds of research each year in support of realizing the vision in the Commandant’s Planning Guidance.”

In addition to engaging students, Thomas and his accompanying leaders got acquainted with NPS’ Modeling, Virtual Environments and Simulation (MOVES) program, one of a handful of academic programs at NPS that is exclusively sponsored by the Marine Corps.

“This institute is perfectly suited to quickly think about something, prototype it in a virtual sense, and test it to see if it has merit or not before investing in it for the field,” explained Pugh.

NPS President retired Vice Adm. Ann Rondeau noted that the university is positioned to be a place of modeling and simulation (M&S) for the Navy and the Marine Corps.

“We can help the Navy and Marine Corps understand that M&S can happen here, and we can look at challenges that need M&S to solve them,” said Rondeau. “NPS is a place for growth and potential and there are no other places at this level of integration.”

Thomas also visited NPS’ Center for Autonomous Vehicle Research (CAVR) where faculty and students demonstrated ongoing research on improving artificial intelligence parameters to produce better combat simulations, advancements in autonomous vehicles, and partnerships with 5G companies to encourage further developments through the broadband network.

“From my perspective, the highlight of the trip was the opportunity for the general officers to talk directly with the NPS students,” said Pugh. “I hope that the ACMC and the other generals validate what I am sure they already suspect—that NPS students represent incredible potential to solve many of today’s tough challenges and to provide the 21st century leadership our 21st century force will require.

“This trust should result in NPS students getting the first crack at really hard operational problems,” continued Pugh. “And, as our alumni progress through the ranks, they will be uniquely qualified for the most demanding leadership jobs in the Marine Corps.”

<https://nps.edu/-/marine-corps-assistant-commandant-explores-emerging-concepts-capabilities-at-nps>  
<https://www.navy.mil/Press-Office/News-Stories/Article/2444551/marine-corps-assistant-commandant-explores-emerging-concepts-capabilities-at-na/>  
<https://www.marines.mil/News/News-Display/Article/2444953/marine-corps-assistant-commandant-explores-emerging-concepts-capabilities-at-nps/>

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## EDUCATION:

### SMWDC Graduates Seven New Amphibious Warfare Tactics Instructors

*(DVIDS 4 Dec 20)*

Seven Warfare Tactics Instructor (WTI) candidates completed the Amphibious Warfare (AMW) WTI qualification course on December 4, and joined the growing team of Naval Surface and Mine Warfighting Development Center (SMWDC) WTIs across the Surface Force.



AMW WTIs are warfighting experts and one of the four surface warfare WTI specialties, alongside Integrated Air and Missile Defense (IAMD), Mine Warfare (MIW), and Anti-Submarine Warfare/Surface Warfare (ASW/SUW) WTIs.

The path to becoming a WTI begins with top-talented Surface Warfare Officers (SWOs) submitting an application to SMWDC to become a WTI. Junior SWOs do not need to have tactical experience, and they can apply for any of the four WTI specialties regardless of what platforms they have served aboard. If selected, the WTI-candidates complete a 2-week long Instructor and Tactics course, and then 13-33 weeks of tactical warfare training, depending on the warfare specialty area.

The graduation ceremony was held onboard Joint Expeditionary Base Little Creek-Ft. Story at SMWDC's AMW Division. Rear Adm. Robert Katz, commander of Expeditionary Strike Group 2, spoke to the newest graduates and offered congratulations. Katz spoke to the significant value of the information the WTIs received during training, and of the benefit of their training to the fleet.

"The value in the knowledge in the AMW WTI qualification you have earned during this course of instruction is unique," said Katz. "You are now joining an elite group who provide invaluable training and support to the fleet. Inspire your juniors to follow in your footsteps, train your peers, provide honest feedback to your seniors, and I look forward to seeing you on the waterfront."

Following all guidelines for reducing the spread of COVID-19, SMWDC conducted the WTI graduation ceremony with the minimum number of personnel, and maintained social distancing.

The newest AMW WTIs are Marine Maj. Nathan Bedle, Lt. Nick Gonsalves, Lt. Katie Griffin, Lt. Paul Hast, Lt. Chris Hebig, Lt. Alexander Hoersten, and Lt. Charles Marshall. Gonsalves was selected as the class Honor Graduate for academic excellence, and Hast was presented the Iwo Jima Leadership award - selected by his peers for superb leadership qualities displayed throughout the fifteen-week course. Lt. Steve Zappa, AMW Division WTI instructor, received the Outstanding Instructor award.

The 15-week AMW WTI course of instruction incorporates all aspects of AMW. Students apply amphibious doctrine and TTPs during the course through student-led briefings, practical applications, and open forum discussions. Students exercise tactics in synthetic training evolutions conducted at the Center for Surface Combat Systems' Ship Self-Defense System trainer onboard Wallops Island, and one-on-one immersion training with Marine Corps personnel from each element of the Marine Air-Ground Task Force onboard Camp Lejeune, N.C. The immersive experience teaches students to plan and execute missions across the range of military operations with their Marine Corps counterparts – a crucial element of AMW mission success.

After earning qualification, WTIs complete a production tour, where they bring their skills to bear by providing advanced tactical training, developing tactics and doctrine, providing operational support, and crafting capability assessments. A pilot program at Naval Postgraduate School (NPS) is taking four fleet WTIs and giving them academic theory behind those tactics to make them even better warfighters; the program expects to double next year. SMWDC values the education officers receive at NPS, and this new program shortens certain curriculums allowing WTIs to obtain an accelerated master's degree without the lengthy in-residence requirement.

WTIs are a key element for accomplishing SMWDC's mission. Through a range of operations from updating or creating doctrine and TTP, to providing training ashore and afloat during Surface Warfare Advanced Tactical Training (SWATT) events and similar exercises, WTIs are shaping doctrine and its implementation in the fleet.

SMWDC is a subordinate command of Commander, Naval Surface Force, U.S. Pacific Fleet. SMWDC headquarters is located onboard Naval Base San Diego and has four divisions located in Virginia and California focused on AMW, MIW, ASW/SUW, and IAMD.

<https://www.dvidshub.net/news/384614/smwdc-graduates-seven-new-amphibious-warfare-tactics-instructors>

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## FACULTY:

### **‘These Mountains Could Turn into Jelly.’ Above Santa Cruz, Residents Fear Devastating Mudslides**

*(Los Angeles Times 8 Dec 20) ... Susanne Rust*

The fire that rampaged through the San Lorenzo Valley in August and September burned hotter and destroyed more acreage than anyone in these rugged, rural and breathtaking mountains can remember.

The CZU August Lightning Complex fire killed Tad Jones, a 73-year-old man who lived in the mountains above Santa Cruz. It also destroyed hundreds of homes, displacing residents, and left scores without potable water.

Now the region is bracing for more devastation, in the form of potentially deadly debris flows caused by winter storms. Taking advantage of an unusually dry November and early December, local first responders and government agencies are frantically cleaning the debris left behind by the fires, and securing the search and rescue equipment they will need for the mudslides almost sure to come.

Yet even with the looming threat, public officials and residents are confident that most residents will return and rebuild.

“If there’s one thing you need to know about the people who live in the Santa Cruz Mountains,” said Mark Stone, the area’s state assemblyman, “they are resilient.”

Federal, state and local scientists, along with other experts, all say that widespread and potentially devastating debris flows are likely to hit the region this winter.

That’s because the Santa Cruz Mountains, with their steep terrain and history of drenching storms coming off the Pacific, were burned so badly and extensively that the lattice of roots and foliage that typically holds the ground in place is gone.

“The worry is that in some places, the sides of these mountains could turn into jelly” and slough off, said Brian Collins, a civil engineer with the United States Geological Survey.

But people who’ve chosen to live in these normally damp redwood forests, not far from the Bay Area but isolated because of the rugged topography, are accustomed to the risks of mudslides, earthquakes, floods and drought. “They’re undaunted,” said **Stone, a former tech industry attorney and professor at the Naval Postgraduate School.**

Several years ago, a large tree fell across California Highway 17, the mountainous and treacherous high-speed corridor connecting Santa Cruz and San Jose.

“Traffic was stopped. The lanes were completely blocked,” Stone said. But before Caltrans could arrive, locals had chain-sawed the tree to bits and removed it from the road.

“They all just got out of their cars, grabbed a chain saw out of their back seat, trunk or flatbed, and got to work,” he said. “That’s just the way they do things.”

Mark Bingham, chief of Boulder Creek’s fire department, laughed when he heard the story.

“It’s true,” he said. “When I commuted over to Santa Clara, I always carried a chain saw. You never knew what would happen. But you also knew to always be prepared. Because stuff happens. It just does.”

It’s why he’s now working overtime — training local and regional firefighters and rescue workers — to prepare for a winter that he and other public officials are eyeing with trepidation.

Collins, the USGS engineer, is assisting Santa Cruz County officials and the state’s geological survey to research debris flows and measure soil saturation throughout the area.

He said that although fire-triggered debris flows are common in Southern California — like the ones that struck Montecito in 2018 — they are relatively rare in the Santa Cruz Mountains, where fires rarely burn so widely or with such intensity.

Which isn’t to say the area hasn’t experienced debris flows.

“We probably get two or three a year that close roads or cause some kind of nuisance,” Bingham said.

In 1982, a lethal debris flow struck at Love Creek, just east of Boulder Creek’s downtown. The slide was not in a burn area, but instead resulted from prolonged, torrential rains that saturated the soils and turned them to liquid.



It killed 10 people, including two children, and destroyed 30 homes. Twelve others died across Santa Cruz County.

The toll of that disaster is haunting for many, including Bingham, who was little more than a toddler at the time — but whose uncle was a first responder. It stuck in his mind this summer as he watched the fires burn along the ridges and through the neighborhoods of his town.

“I thought, ‘Winter is coming,’” he said, and he began preparing.

Bingham became chief of the fire protection district in November 2019 after a two-month transition. During his brief tenure, he has overseen the town’s response to the COVID-19 pandemic, dealt with an active shooter who killed a police officer and responded to several George Floyd demonstrations and the area’s largest recent conflagration.

With no illusion that the next few months will be any easier, he’s leaning on the lessons he’s learned in the last 13. He’s also preparing his town, county responders and others for a winter of potential disaster.

Two weeks ago, his department hosted a debris flow search and rescue training seminar, with help from the Federal Emergency Management Agency, and local and regional fire, search and rescue instructors.

Debris flow veterans, such as Eric Gray, a Santa Barbara fire captain who was at the scene at Montecito, and Thom Jaquysh and Tim Houweling, with California’s Task Force 3, walked attendees through their experiences and best practices.

He’s also charted new maps for the area, with designated evacuation zones developed with help from the sheriff’s department and neighboring fire departments. Out-of-town first responders will have these maps, with QR codes on them, should they need to come in for search and rescue operations this winter.

“I want to make sure they know where all the access roads are, which roads are gated, how to get in, where there are bridges,” Bingham said. “I don’t want anybody getting stuck or turned around or delayed because they don’t have the information they need.”

And, with the very little money he has to work with — he’s in an unincorporated district that relies on property taxes for funding, where hundreds of houses burned this summer — he’s also trying to secure equipment. These include mud lances and dry suits that will allow his volunteers to get where they need to go, without risking their lives or ruining their firefighting equipment.

In the meantime, the county and state are working on a very aggressive timeline to get debris from the fires cleaned up, said Jason Hoppin, spokesman for Santa Cruz County.

Phase I, hazardous material removal, was completed on Dec. 1. And applications for Phase 2 — debris removal — are due on Dec. 15.

Bradley Brown, the owner of Big Basin Vineyards, said fire crews saved his winery from burning, although they couldn’t save his house.

An architectural marvel and local music venue, the stone-and-beam home was designed, in part, as a solar calendar — capturing the sun’s rays for full effect at the solstice and equinox. It is now mostly rubble and ash.

During a November visit, a reporter could see a few scorched books still sitting in the stone shelves. The roof’s terra cotta tiles, held together by wire, dangled from the few stone walls that remained, and chimed in the breeze.

He’s unsure if he’s going to rebuild the house, or if he even can. It was unique. But he’s not giving up on the winery.

“We’ve got work to do. But that’s what we do. We roll up our sleeves and get moving,” he said, adding that he spent years working the land with his own hands — chopping down trees, digging up roots, planting the vines.

Pointing toward a slump in a nearby hill — the unmistakable fingerprint of a past debris flow — he said he’s not too concerned about his grapes and the potential for landslides. He’s high up on a hill, and most of the vines and grass are still rooted, providing a structure for the soil.

But if another natural disaster should fall, he said, it’ll just be one more in a long line of them.



“You don’t live here or move here if you’re risk averse or unwilling to work hard,” he said. “You wouldn’t survive.”

<https://www.latimes.com/california/story/2020-12-08/santa-cruz-mountains-fire-mud-slides>

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## ALUMNI:

### Coloradans Matthew Dominick, Jessica Watkins Selected to NASA’s Artemis Team

(CBS Denver 11 Dec 20) ... Ben Warwick

Two Coloradans will play a pivotal role in returning humans to the moon. NASA introduced the Artemis Team on Wednesday, and two Colorado natives are on the list.

Lieutenant Commander Matthew Dominick and Dr. Jessica Watkins were selected to the team. Dominick hails from Wheat Ridge, while Watkins is from Lafayette.

Lt. Cdr. Dominick graduated from the University of San Diego in 2005 with a degree in Electrical Engineering, with minors in Physics and Mathematics. He joined the U.S. Navy through the ROTC program and flew F/A-18 Super Hornets in Operation Enduring Freedom, the response to the September 11th terror attacks. **He attended the Naval Postgraduate School where he earned a Master of Science in Systems Engineering.** He was selected as an Astronaut Candidate in 2017 and completed the required two years of training in 2019.

Watkins graduated from Stanford University with a degree in Geological and Environmental Sciences and a Doctorate in Geology from UCLA. Her research primarily focused on emplacement mechanisms of large landslides on Mars and Earth, as seen through orbital image and spectral data analysis and geologic mapping. She also was selected as an Astronaut Candidate in 2017, and after work in several fields, graduated the program in 2019. While at Stanford, Dr. Watkins was the 2008 Division I College Rugby National Champion.

Both astronauts are currently awaiting their flight assignments.

They spoke to CBS4 in January 2020 about their experiences.

“It’s a pretty awesome opportunity to be a part of this group at this moment in history. It’s a really exciting time in human space flight. Whoever it is that puts those boots back on the ground and the first woman that does so is going to be super exciting for all of us,” Watkins told CBS4’s Dominic Garcia.

Dominick and Watkins say even though Mars is the goal one day, going back to the moon is the next step.

“It’s an essential next step for us. We’ve been working in lower orbit for 20 years. We’ve had a continuous human presence on The International Space Station for the past about 19 years. We’ve learned so much about doing that, about what happens to the human body, about how to operate, about equipment. Now the next logical step is to go back to the moon in a sustainable way. To build the infrastructure to stay, so we can build our moon to Mars program,” Dominick said.

As part of the process to become astronauts, the candidates trained in robotics; systems used aboard the space station; exercises that simulate spacewalking; flying T-38 jets; and learning the Russian language due to NASA’s partnership with Roscosmos for launches to the space station and talking to Russian astronauts aboard the ISS.

In all, 18 people were selected to the Artemis Team. Among the 10 men and 8 women are Kjell Lindgren, a 1995 U.S. Air Force Academy Graduate with a Bachelor’s degree in Biology and a minor in Mandarin Chinese. He was part of the Air Force Parachuting Team while a cadet. In 1996, Lindgren earned a Master’s degree in Cardiovascular Physiology from Colorado State University. He also earned a Doctorate of Medicine from the University of Colorado in 2002. Raja Chari, another astronaut selected to the Artemis Team, graduated from the Air Force Academy in 1999.

<https://denver.cbslocal.com/2020/12/11/matthew-dominick-jessica-watkins-nasa-artemis-team/>



## **A Submarine Officer and a Handful of Military Pilots are in the Running to be the First Woman to Walk on the Moon**

*(Business Insider India 11 Dec 20)* ... Ryan Pickrell

The National Aeronautics and Space Administration (NASA) announced Wednesday the names 18 astronauts who could return to the moon as part of the Artemis program, a new lunar exploration program.

"I give you the heroes who will carry us to the Moon and beyond - the Artemis Generation," Vice President Mike Pence said Wednesday. "It is amazing to think that the next man and first woman on the Moon are among the names that we just read."

The Artemis program is a lunar exploration effort aimed at not only sending people back to the moon by 2024 but also establishing a sustainable presence on the moon by the end of this decade.

Half of the 18 people selected are women. Among the women in the running for the historic achievement of being the first woman to walk on the moon are four US military service members: Kayla Barron, Nicole Mann, Anne McClain, and Jasmin Moghbeli.

### **Maj. Jasmin Moghbeli:**

Born in Germany, Moghbeli is a major in the US Marine Corps. She holds a bachelor's degree in aerospace engineering with information technology from the Massachusetts Institute of Technology. She also has a master's degree in aerospace engineering from the Naval Postgraduate School.

Moghbeli is a graduate of the US Navy Test Pilot School. When she was selected to join NASA in 2017, she was testing H-1 helicopters for the Marine Corps in Arizona.

While details are limited in Moghbeli's official biography, NASA says that she has flown 150 combat missions and has accumulated over 1,600 flight hours.

### **Lt. Cmdr. Kayla Barron:**

Barron was part of the first class of women to commission as submarine officers, according to her official NASA biography. As a Submarine Warfare Officer, she completed three strategic deterrent patrols aboard the Ohio-class ballistic missile submarine USS Maine.

In 2017, NASA selected Barron, who was working at the Naval Academy at the time, to join Astronaut Candidate Class.

### **Lt. Col. Nicole Mann:**

Mann, a California native and Marine Corps lieutenant colonel, has a bachelor's degree in mechanical engineering from the US Naval Academy and a master's degree in the same field from Stanford University.

Having earned her wings of gold as a naval aviator, she deployed as a combat pilot aboard the USS Enterprise, flying a total of 47 combat missions in support of Operation Iraqi Freedom in Iraq and Operation Enduring Freedom in Afghanistan.

She later served as a test pilot flying F/A-18 Hornets and Super Hornets. In her career, she has racked up over 2,500 flight hours in 25 different aircraft types.

Mann, who joined NASA in 2013, has most recently been training for the crewed flight test of Boeing's Starliner spacecraft, according to her official NASA biography.

### **Lt. Col. Anne McClain:**

McClain, a US Army lieutenant colonel, was born in Washington. She has a bachelor's degree in mechanical/aeronautical engineering from the US Military Academy at West Point and a master's degree in aerospace engineering from the University of Bath. She also has a master's degree in international relations from the University of Bristol.

She earned her wings as an OH-58D Kiowa Warrior scout/attack helicopter pilot, and she flew more than 800 combat hours and over 200 combat missions in support of Operation Iraqi Freedom. As a senior Army aviator, McClain has over 2,000 flight hours in 20 different aircraft.

According to her official biography, she joined NASA in 2013. Most recently, she served as a flight engineer on the International Space Station.

<https://www.businessinsider.in/science/news/a-submarine-officer-and-a-handful-of-military-pilots-are-in-the-running-to-be-the-first-woman-to-walk-on-the-moon/articleshow/79671275.cms>

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