



# STEM2Stern

Opening Minds • Capturing the Future



CAPTURING THE FUTURE  
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## COMPETITION DRIVES INNOVATION FOR STUDENTS AND THE NAVY

BY KELLY COOPER, OFFICE OF NAVAL RESEARCH

### WHERE IS THE NAVY'S FUTURE WORKFORCE?

The U.S. Navy has a fundamental and perpetual interest in attracting a stream of educated, trained and experienced people interested in contributing to its operations, technologies, science and engineering. As a civilization, we are now 100 percent dependent on technology. The Navy's future battles will involve robotics, cybersecurity, networks, sensors and analysis of big data. Technology, however,

is not static; it advances in small steps and large leaps across hundreds of individual technologies and academic disciplines.

This constant technological advance drives a companion need for naval scientists and engineers who are well educated, trained and experienced across a vast range of technologies, including some that do not yet exist. Ideally, these people bring with them

current theoretical knowledge, the latest technical training, experiences in applying scientific method and an interest in new ideas that may ameliorate existing naval problems or create new technological opportunities.

People joining the Navy and Marine Corps' science and technology (S&T) community are a part of a rare group; they are highly educated at all levels through post-doctoral work. Many have been trained purposefully in technical specialties of importance to the Navy. However, few people (particularly when they are young) consider how being a member of the naval S&T workforce may fulfill their destiny. Most budding young scientists and engineers need to be exposed to the career opportunities that exist and be encouraged to consider them seriously.

Therefore, to attract young talent, the Department of the Navy (DoN) funds a wide range of educational, training and experiential learning activities, each specifically geared to particular levels of education, interest and activity. There are naval engineers introducing students in elementary schools to simple undersea robots. At the other end of the education spectrum, the DoN funds collegiate scholarships, fellowships, grants, undergraduate programs and laboratory

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RoboSub competition at Space and Naval Warfare Systems (SPAWAR) Center Pacific's Transducer Evaluation Center in San Diego. (Photo by SPAWAR)



## MESSAGE FROM THE NAVAL STEM EXECUTIVE

**A**s every child learns growing up, it's important to be prepared. In fact, preparation is a key to success. Proper training and situational awareness is a critical element to achieving one's goals, both in everyday life and military missions alike. The great American scientist George Washington Carver put it this way: "There is no short cut to achievement. Life requires thorough preparation."

And nowhere is preparation more important than in nourishing and discovering the next generation of engineers and scientists. It won't just happen by luck—it will take unwavering dedication and preparation from leaders today to create the scientific minds of tomorrow.

That's where our nation's Sailors and Marines come in. America's warfighters have many impressive talents, including the ability to define objectives and prepare ways to accomplish difficult missions. The Navy recognizes that the

drop in numbers of students pursuing science, technology, engineering and mathematics (STEM) degrees in recent years is an obstacle to our nation's future growth. For that reason, the Department of the Navy will partner with government, industry, educators and parents to support STEM education.

Naval leaders know that having a well-educated scientific workforce will be an essential component of this great nation moving forward. This is a message given to every midshipman at the Naval Academy and one that continues to be emphasized by senior Navy and Marine Corps leaders.

So, where do we get these engineers, these scientists of tomorrow? We start with supporting the best STEM education efforts out there—from finding and developing programs that excite young children about science and math in elementary schools, all the way to efforts designed to encourage and sustain college students who are in STEM majors.

This nation will meet our STEM challenge. Have no doubt about that. But it will take dedication, preparation and time.

Sometimes, there's a light-bulb moment of inspiration, and something great comes about quickly and with ease. But with many of the most important milestones in life, it takes hard work, preparation and recognition that something important is worth fighting for. American inventor Thomas Edison said: "We often miss opportunity because it's dressed in overalls and looks like work."

Americans have work to do to increase our numbers of scientists and engineers and keep us on the cutting edge of innovation. I thank all of you who are out there with sleeves rolled up, doing the sometimes hard but always vital work that needs to be done.

Sincerely,

Matthew L. Klunder  
Rear Admiral, U.S. Navy  
Chief of Naval Research  
Naval STEM Executive

## NAVAL VOLUNTEER SPOTLIGHT: TOBY RATCLIFFE

**A**fter graduating from Cornell University in 1979 with a bachelor's degree in physics, I joined the staff of the Naval Surface Warfare Center (NSWC) Carderock Division in Bethesda, Md. NSWC Carderock is the U.S. Navy's premier experimental facility for testing hydrodynamic designs of ship and submarine models, which are precursors to the ships and submarines actually deployed at sea. I received my master's degree in ocean engineering from George Washington University in 1987.

For the last 34 years, I have been involved in numerous model-scale and full-scale experiments aimed at measuring the flow around surface ships. I also have directed experimental programs with surface ship models to develop data sets to be used in predicting the wave pattern around a ship.

Beginning in 2009, in addition to my technical responsibilities, I became the NSWC Carderock K-12 outreach coordinator. In that role, I coordinate more than 50 NSWC Carderock science, technology, engineering and mathematics professionals to work with students and teachers in local schools, bringing authentic engineering experiences into the classroom. I also have taught an applied engineering mathematics course to high school students who were dually enrolled in Wheaton High School's Engineering Academy and the University of Maryland. Currently, I am a lecturer for the University of Maryland, responsible for developing a curriculum, preparing lectures and grading homework for an online course sponsored by the Department of Defense/Advanced Distributed Learning for the Next Generation Environment, with a target audience of military service men and women, as well as transitioning veterans.



# CREATING THE FUTURE ENGINEER THROUGH INTERNSHIPS

BY OFFICE OF NAVAL RESEARCH

After months of waiting by the postal and email boxes, students now are receiving offers to participate in internship programs that could help shape their scholastic and career aspirations.

The Department of the Navy sponsors two

such programs, both of which are designed to show practical applications of science, technology, engineering, and mathematics (STEM) education, while providing students with on-the-job experience at participating naval laboratories across the country.

"These internships present a unique opportunity for students to interact directly with naval employees doing work in a variety of fields and disciplines, while conducting leading-edge research," said Dr. Reginald Williams, ONR Summer Internship program manager. "Students participating in these internships will come away with the experiences and skills needed to have successful careers in the research and development arena."

The Science and Engineering Apprenticeship Program (SEAP) gives high-school students an intensive eight-week introduction to naval engineering. It equips students with the necessary tools for analyzing real-world problems, working in a team environment and interacting with senior personnel.

College-aged students can build upon their knowledge and experience by participating in the Naval Research Enterprise Internship Program (NREIP). This 10-week program is open to undergrads and graduate students seeking degrees in the STEM disciplines. By affording participants hands-on training and mentors, it aims to cultivate a new generation of highly qualified scientists and engineers to help solve the Navy's complex challenges.

Both programs expose students to a range of research areas steeped in STEM knowledge, including air, land and sea vehicles; crew safety; robotics; anti-terrorism; chemistry; biology; acoustics; laser communications; computer hardware and software development; avionics; night vision; analysis of viruses; and traumatic brain injury.

The internships are highly competitive, selecting interns based on academic achievement, letters of recommendation and personal interests. Stipends typically exceed other summer STEM opportunities.

For more information on these programs please visit <http://seap.asee.org/> and <http://nreip.asee.org/>.

## SCIENCE AND ENGINEERING APPRENTICESHIP PROGRAM

Naval facilities participating: **22 facilities**

Facility locations: **14 states**

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*Summer of 2014*

Submitted applications: **2,536**

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*Summer of 2013*

Submitted applications: **2,018**

Selected applicants: **283 (14%)**

Total actual participants: **274**

## NAVAL RESEARCH ENTERPRISE INTERNSHIP PROGRAM

Naval facilities participating: **23 facilities**

Facility locations: **13 states**

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*Summer of 2014*

Submitted applications: **2,209**

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*Summer of 2013*

Submitted applications: **1,148**

Selected applicants: **447 (39%)**

Total actual participants: **312**

# NAVAL STEM ACRO

Navy and Marine Corps STEM activities take place at locations across the country. Many are local and take place at local schools or universities. Collectively, these activities help the Navy develop the workforce of the future. This page features just a small snapshot of the activities taking place across the country.

## SSC Pacific in Hawaii—Pearl City, Hawaii

The Space and Naval Warfare (SPAWAR) Systems Center Pacific (SSC Pacific) provides command, control, communications, computers, intelligence, surveillance and reconnaissance expertise to warfighters in the Asia-Pacific region.

SSC Pacific in Hawaii has been reaching out to K-12 students to promote science, technology, engineering and mathematics (STEM) since early 2008, supporting the state's initiative to increase technical job opportunities throughout Hawaii through its STEM education program.

More than 60 SSC Pacific scientists and engineers engage with students from more than two dozen K-12 public, private and charter schools to demonstrate the relevance of math and science via hands-on experiments and real-life examples of technology and to help introduce future generations of STEM professionals to the fun challenges of science and technology. Multiple tools such as robotics (SeaPerch underwater vehicles; FIRST Robotics; VEX Robotics; micro robotics and Botball), material science-based STEM learning modules; cyber challenges and projects in alternative energy help volunteers introduce future generations of STEM professionals to the fun and challenges of science and technology.

## NPS—Monterey, Calif.

As the nation's premiere national security research university, the Naval Postgraduate School (NPS) produces highly qualified graduates in science, technology, engineering and mathematics (STEM) disciplines critical to ensuring our country's superiority in national security. The interdisciplinary faculty and student expertise is harnessed to engage and inspire youth through a number of special NPS STEM programs. For example, NPS resident astronauts Dan Bursch, Jim Newman and Steve Frick regularly lead talks at K-12 schools, inspiring students to consider STEM careers. Middle and high school students explore emergent unmanned and robotic systems technology at the annual "Robots in the Roses" event. NPS' interns are introduced to female scientists and military officers during "PhDs + Polka Dots." The National Naval Officers Association and the Cyber Professional Association, student-run programs, offer free one-on-one tutoring and mentoring, student scholarships and other STEM outreach activities. Additionally, NPS faculty and students are vital members of local STEM efforts, including FIRST Robotics Competitions, California State University Monterey Bay Camp Sea Life, Monterey County Science and Engineering Fair, and Monterey Peninsula College Marine Advanced Technology Education.

## NRL-SSC—Stennis Space Center, Miss.

The Naval Research Laboratory at Stennis Space Center (NRL-SSC) is the Navy's leading laboratory for research in ocean and atmospheric sciences.

NRL-SSC supports the Navy's goals of promoting science, technology, engineering and mathematics (STEM). Its STEM program focuses much of its effort on reaching into the community with programs such as SeaPerch, FIRST Robotics and MATHCOUNTS. The NRL STEM team also aims to support STEM teachers by maintaining an active teacher-training program utilizing the Greater New Orleans STEM Initiative, ASM International and Sally Ride Science.

In addition, NRL-SSC seeks to increase the overall level of awareness and interest of students in STEM activities by participating in STEM events throughout the Mississippi Gulf Coast and Greater New Orleans metro areas. These activities include high school career days, science fairs, science festivals and other events where their scientists and engineers can engage with students directly.

## USNA—Annapolis, Md.

The United States Naval Academy (USNA) is steeped in a rich tradition of training the next generation of naval leaders. Every year, the Academy aims to award 65 percent of its midshipmen with science, technology, engineering and mathematics (STEM) degrees. More than 250 midshipmen participate in STEM outreach programs, honing their leadership and critical-thinking skills, as well as encouraging thousands of students to pursue STEM careers.

USNA provides a wide range of interactive STEM programs for K-12 students, including regional robotics competitions, engineering and science days, Girls Only STEM Days and STEM camps.

Additionally, the Academy hosts the annual Naval Academy Science and Engineering Conference, run by undergraduates, which brings together policy makers, science advisors, faculty and students to discuss STEM issues and challenges.

Teachers also benefit from USNA STEM efforts. The SET SAIL (STEM Educator Training in Project- Based Learning) and STEM in a Box curriculum are provided at no cost to educators, reaching hundreds of teachers worldwide each year.





# STUDENT SPOTLIGHT

## Parth Thakker



importantly, motivating for us to stay connected to our interest in science, technology, engineering and mathematics (STEM) fields.

My experience with JSHS has motivated me to apply to multiple U.S. military academies and has contributed to my understanding of what a STEM career with the military really entails. Going forward, I hope to pursue a joint degree in chemistry, applied math and/or economics.

Looking to JSHS 2014, I have submitted a new paper for review at the state level and hope to compete again at the national symposium. While my work last year was homegrown, stemming from a childhood hobby of rocketry and my involvement in the U.S. Civil Air Patrol, I have entered this year with lab-supported research involving novel biocompatible quantum dots as photosensitizers for solar cells. So far, this project has been chosen as one of 40 finalists in the Intel Science Talent Search – and might hopefully garner similar success at JSHS in the spring!

Parth Thakker is a senior at the North Carolina School of Science and Mathematics in Durham, N.C.

**M**y experience at the national 2013 Junior Science and Humanities Symposium (JSHS) was extraordinary. No other science competition I've attended can compare with the quality of students and sense of camaraderie I felt with my fellow competitors at JSHS.

My research represented several years of cumulative work with rocket propellants. The JSHS presentation format allowed me to delve into the most important parts of my research while still leaving room for active discussions with judges and peers.

During my time at JSHS, we met local Department of Defense researchers, private contractors and military personnel in small group settings to discuss their career paths and current projects in the armed forces. These conversations were exciting, inspiring and, most

## Darby Schumacher



Darby with Google Glass at the Fireside Chats at Chattanooga Theatre Centre.

national JSHS competition in Dayton, Ohio. In addition to reconnecting with other student researchers, my experience was enhanced by the activities, presentations and speakers. The most exciting part of the event, however, took place a day early to fly home and take the SAT. I received a call informing me that I'd won second place in the environmental science category and a scholarship for \$8,000!

I won't be competing this year because my research is on hiatus; however, I am getting more involved with STEM initiatives across Tennessee, marrying two of my passions—service and science—to help create better futures for girls in my city. During my junior year, I started a program called Stronger STEMs, Brighter Blossoms that focuses on exposing inner-city girls to scientific principles and research. This program now serves as my Miss America Organization platform as I vie to become Miss Tennessee.

Darby Schumacher is a senior at the Baylor School in Chattanooga, Tenn. and Miss Metropolitan 2014.

**I**n 2012, after many years and iterations of my design, working mainly on my kitchen counter with various probes and test kits and limited access to a water lab, my research about storm water pollution and filtration paid off. I received an honorable mention at the Tennessee state science competition, which earned me a trip to Washington, D.C., for the National Junior Science and Humanities Symposium (JSHS). About 250 other students joined me from all over the United States. These students were just like me: motivated to pursue their dreams and independent enough to tackle an issue and find a scientific solution on their own time.

Last spring, I competed again at the state competition; this time I won first prize and got to return to the

# INSPIRING STUDENTS FOR A BRIGHTER TOMORROW

BY SIERRA JONES,  
OFFICE OF NAVAL RESEARCH

In April, the nation's capital will host two national science, technology, engineering and mathematics (STEM) events—the 52nd annual National Junior Science and Humanities Symposium (JSHS) and the third annual USA Science and Engineering (S&E) Festival. Both events will provide students with unique opportunities to explore STEM careers, original

student-led research and hands-on STEM activities.

JSHS began in 1958 as an annual research symposium for high school students in grades nine to 12. The program is composed of both regional and national competitions, which promote and recognize students for their outstanding achievements in original scientific research. The Army was the first military service to sponsor the event, but in 1995, the Departments of the Navy and the Air Force began their sponsorship, creating a tri-service competition.

Approximately 9,600 high school students from across the United States, Puerto Rico and Department of Defense (DoD) schools in Europe and Asia compete annually. They submit their research papers for review at one of 48 regional competitions held at universities around the nation. The top five students from each region are invited to attend the national JSHS competition.

These 240 finalists present their research, via oral or poster presentation, and vie for scholarships and cash awards in seven areas of competition. The top three students from each category

are awarded undergraduate tuition scholarships in the amounts of \$12,000 for first place, \$8,000 for second place and \$4,000 for third place.

JSHS runs April 23-27 at the Renaissance Arlington Capital View in Arlington, Va.

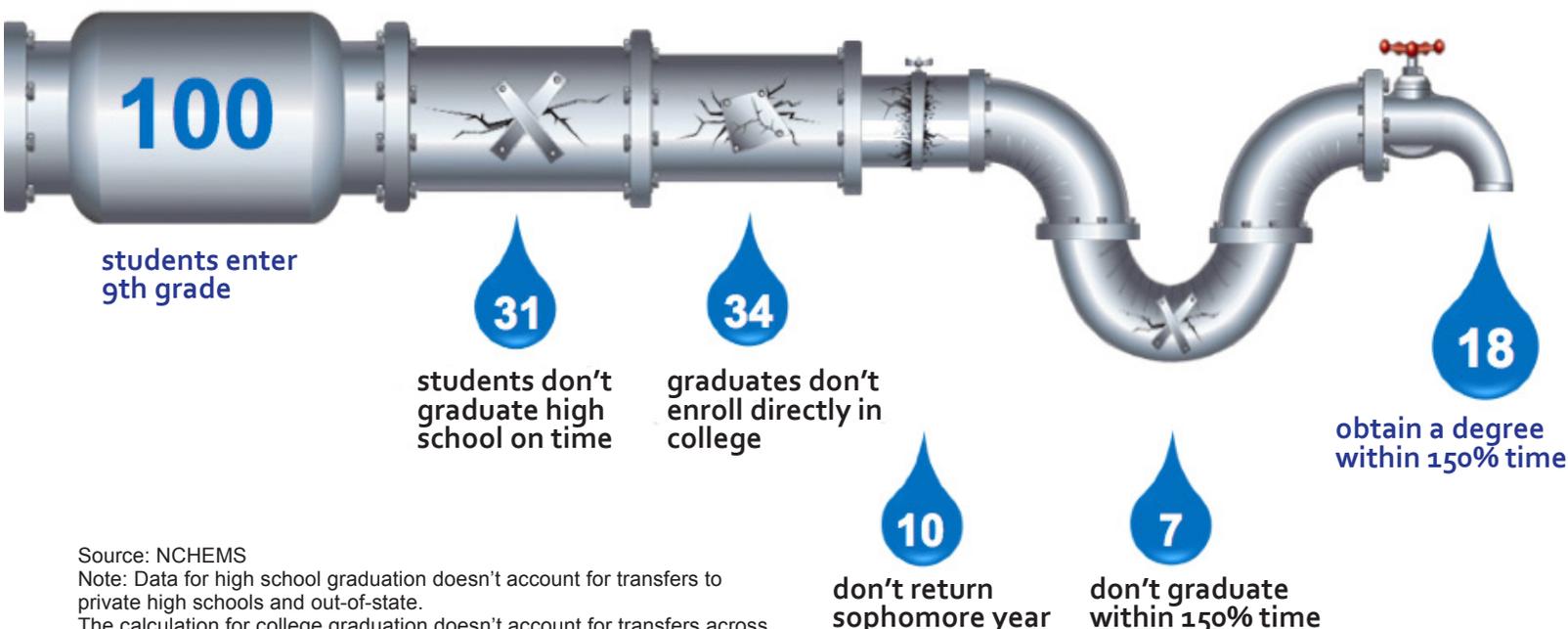
The USA S&E Festival is the country's largest and only national science festival. It began in 2010 as a grassroots effort to advance STEM education and stimulate students' interest in science and engineering. Exhibitors from across the federal government, DoD, STEM education nonprofits and industry all bring their most inspiring and engaging science and engineering materials to display. This year's event will be held at the Walter E. Washington Convention Center, in Washington D.C., on April 24-27. More than 750 STEM organizations are expected to present hands-on STEM activities to the more than 250,000 people estimated to attend the two-day Grand Finale Expo.

The convergence of these events led organizers to create opportunities for interchange. On April 25, 144 of the 240 overall finalists will present their posters to a judging team for the opportunity to win cash awards in the amounts of \$1,500, \$1,000 and \$800. In addition, JSHS participants will be given the opportunity to visit the expo and explore the broad range of STEM initiative across the DoD and other government agencies, research institutions, high-tech companies, museums, educational institutions and community organizations. By showcasing these opportunities, organizers hope to lay the groundwork for developing the next generation of scientists and engineers.

For more information on these events, please visit the following websites: JSHS - <http://www.jshs.org/> and USA S&E Festival - <http://www.usasciencefestival.org/about/mission.html>.

Sierra Jones is a contractor for ONR Corporate Strategic Communications.

## OUR KIDS' FUTURES ARE LEAKING!



Source: NCHEMS

Note: Data for high school graduation doesn't account for transfers to private high schools and out-of-state. The calculation for college graduation doesn't account for transfers across institutions.



# STUDENTS COMPLETE NAVAL ENGINES DESIGN PROGRAM AT NSWCCD-SSES

BY JOSEPH BATTISTA, NSWCCD-SSES PUBLIC AFFAIRS

**T**hirty middle- and high-school students completed a six-week Naval Engines Design Program (NEDP) at Naval Surface Warfare Center Carderock Division – Ship Systems Engineering Station (NSWCCD-SSES), in Philadelphia, Pa. The course, organized in partnership with the Urban Youth Racing School, exposes students from underrepresented communities to the types of work performed by naval engineers. This program combines hands-on training with classroom instruction on various types of naval engines.

During the Naval Engines program, participants receive classroom instruction from professional engineers, complete oral presentations and weekly homework assignments. The final class included turning in a group paper and giving a presentation where they determined

which type of Navy ship to use based on a real-world situation. Some students even designed their own vessel, which utilized one of the three propulsion systems found on Navy ships. “I’m always impressed by the enthusiasm of these students,” said Mike Zekas, head of NSWCCD-SSES’s Propulsion and Power Systems Division. “Their eyes widen when they first see the size of the engines the Navy uses. It’s a great thing to experience each year.”

Now in its third year, NEDP recruits naval volunteers to teach students about diesel, gas turbine and steam engines, as well as fuel injection, combustion analysis, maintenance, shock testing, borescope inspections,

alternate fuels, lubricating oils and 3-D modeling.

Students received hands-on instruction with gas turbines, a highlight during the program’s third week. Using a flexible borescope, a small camera inserted into the engine to inspect the inside of the engines, participants identified the various engine parts and performed a compressor blade change.

“Getting to see and work on the engines that we learned about in the classes was a great experience,” said Kiana Butler, a 16-year-old NEDP student.

More than 20 NSWCCD-SSES engineers and scientists volunteered their time to mentor the students over the six weeks. Engineers Dan Caguiat, Jennifer Connor and David Dixon, all of the installation’s Propulsion and Power Systems Division, worked with the students during the hands-on training. “It was rewarding to successfully generate

enthusiasm for the theory in the classroom and then allow students to see and touch a real gas turbine,” said Caguiat, a mechanical engineer who has worked at NSWCCD-SSES for 17 years. “This was a particularly enjoyable class to teach because these kids are highly intelligent and motivated.”

“It was wonderful to work with such highly motivated and intelligent young men and women,” said Jennifer Connor, also a mechanical engineer. “I have always had a love of learning and teaching. This was the perfect opportunity to teach about what we do to the next generation.”

The goal of the program is to expose students to the types of work performed by engineers and to encourage them to pursue STEM education and careers. Zekas said he hopes the partnership with Urban Youth Racing School will continue so a new group of eager young minds can learn about naval engines next year.

**“...these kids are highly intelligent and motivated.”**

**Dan Caguiat**  
NSWCCD-SSES Engineer

# BUILDING ENGINEERS: ONE BRICK AT A TIME

BY BETTINA JAHR, NAVAIR CHERRY  
POINT

**T**en middle school students from Goldsboro, N.C., recently participated in a site visit at the Fleet Readiness Center East (FRC-E) at Cherry Point, N.C. The “Mustache Men,” as they are known throughout the FIRST Lego League, were visiting FRC-E to gain exposure to what it’s like to be an engineer—as well as visit with one of their coaches and mentors.

Their coach is Meghan Goering, an FRC-E aircraft strength technical team engineer. Goering found her calling for engineering at a young age while playing with her brother’s Legos. This love of Legos—and an interest in biology and math—led her mom to enroll her in the North Carolina State University Engineering Camp. While at the camp, her interest for engineering was nourished and has continued to grow. Now, years later, she is at Cherry Point and FRC-E working with the engineering group and passing along her knowledge to other young talent.

“If we want to continue to increase the STEM [science, technology, engineering and mathematics] workforce, we must identify potential talent while they are young, cultivate their interest

and create opportunities for involving them in STEM activities,” Goering said. This is why Goering has volunteered her time as a mentor and coach for FIRST Lego League, an international robotics program for nine to 14-year-olds.

During their visit to FRC-E, students toured various production shops and workspaces and met with senior personnel. Seeing so many different engineering opportunities opened the boys’ eyes to the variety of engineering fields they can explore. Students came away from the visit wanting to be engineers—and, as importantly, gained awareness that they could serve the country and our military as engineers. This is how we build future Navy scientists and engineers!



The “Mustache Men” at the Goldsboro Middle School FIRST Lego League Competition at the Triad Math and Science Academy in Greensboro, N.C.

# SNOW, ICE AND RAIN HAVEN’T STOPPED PLANNING FOR SUMMER CAMPS

BY MIKE FERRARO, MARINE CORPS  
SYSTEMS COMMAND



Destini Entzminger and Kevin Hovis (center), a technologist who works for Marine Corps Systems Command’s Marine Air-Ground Task Force Command, Control and Communications Program Management Office, watch a LEGO robot cross a balsa wood bridge June 21, 2013 at Quantico Middle/High School. Destini was one of more than 40 students who attended the annual week-long Quantico Summer Academy, a science, technology, engineering and mathematics camp. (Photo by Carden Hedelt)

**A**lthough the polar vortex had much of the United States covered in a deep freeze this winter, organizations around the country have been busy preparing for their summer programs. And the Marine Corps Systems Command (MCSC) is no exception as volunteers in Quantico, Va., actively prepped for their annual summer camp, held in June.

MCSC will sponsor its annual Robotics Camp with help from Quantico Middle/High School. The camp began in 2010 as an outreach program to increase students’ interest in the science, technology, engineering and mathematics (STEM) fields. Although the theme varies from year to year, each camp provides students the opportunity to see static displays, hands-on exhibits and demonstrations from an assortment of organizations, including the FBI Academy, Marine Corps Warfighting Laboratory and iRobot.

Participants are split into teams, each having a teacher and an engineering mentor. This year’s event will focus on Lego Robotics and will include approximately 60 children of Marines who attend the surrounding schools. The success of these summer camps has MCSC exploring a year-round partnership with Quantico Middle/High School to provide classroom-based student mentoring in STEM.

The Marine Corps Tactical Systems Support Activity (MCTSSA) also will sponsor its second annual Science Week event with funding from MCSC. Approximately 30 students, ages nine to 13, are expected to participate in this event. The group will be divided into six teams, each performing experiments and competing head-to-head on several STEM challenges involving a trebuchet, electronics and robotics. The event is held at Camp Pendleton, Calif. Currently, event participants are children of MCTSSA military and civilian employees.

# HOW ONE STUDENT FOUND HIS PASSION

BY SIERRA JONES, OFFICE OF NAVAL RESEARCH

Summer camp represents an opportunity for some students to meet new friends away from the typical classroom environment. Camp experiences can carry lasting memories and life-changing experiences for camp-goers like La'Fred Gibbons, who spent the summer of 2008 at a joint science, technology, engineering and mathematics (STEM) Summer Institute hosted by both Gulf Coast State College and Florida State University (FSU) in Panama City, Fla.

"I attended the STEM summer science camp when I was an eighth-grader in middle school," Gibbons said. "When I realized that the Lego Mindstorm robot I was working with could be used to pursue a wide range of engineering projects, I knew I had found the career I wanted to pursue."

Ed Linsenmeyer, who coordinates educational outreach for Naval Surface Warfare Center Panama City Division, said the funds to sponsor most STEM projects, like the FSU STEM Institute, are provided by the Department of Defense (DoD).

"The funding that empowers us to participate in these endeavors is channeled through the DoD's National Defense Education Program [NDEP]," Linsenmeyer said. "The summer-science camp Mr. Gibbons is referring to has been structured to attract more students toward STEM-related career paths."

Commanding Officer Capt. Scott Pratt praised these K-12 STEM initiatives, but offered equal accolades to other DoD opportunities offered to students who are looking for paid scholarships.

"The SMART [Science, Mathematics and Research for Transformation] program is yet another tremendous opportunity for students like La'Fred Gibbons," Pratt said. "Eligible students [may] qualify to be paid by DoD to attend college. If selected,



La'Fred Gibbons stands at the entrance to Tuskegee University (Photo by Stefan Smith)

the assigned laboratory considers reporting to the student's college or university just like a change in duty station. Instead of reporting to the student's assigned laboratory, the student simply attends school and then reports back to the assigned laboratory or agency upon graduation."

This is one path Gibbons, now a sophomore pursuing a chemical engineering degree at Tuskegee University, may follow. In 2009, the Panama City warfare center and Tuskegee University formalized a partnership to offer a Scholarship for Service Program for students pursuing master's degrees in systems engineering. The program requires a bachelor of science in engineering and an agreement to three years of service at the parent Naval Sea Systems Command field office.

You can read this original story in its entirety by visiting [http://www.navy.mil/submit/display.asp?story\\_id=70449](http://www.navy.mil/submit/display.asp?story_id=70449).

Sierra Jones is a contractor for ONR Corporate Strategic Communications.



## NAVSEA & TUSKEGEE UNIVERSITY PARTNER FOR SUCCESS

Since 2009, the Naval Surface Warfare Center Panama City Division and Tuskegee University have partnered to develop a specialized Master of Science in system engineering program. This program is an intensive one-year course of study that offers students a focused curriculum in systems engineering, designed specifically to enhance Naval Sea Systems Command's (NAVSEA) technical workforce competencies. Graduate students gain distinct knowledge and skills in specific areas such as sensors, signal processing, software development, cost analysis, optimization theory and information security. In the program's first three years, 58 students graduated with Master of Science degrees in systems engineering through this program, and most of them have come to work for the Department of the Navy. As a result of this program, NAVSEA has increased its diversity hires within the technical community and has created a model for designing naval-relevant programs with other historically black colleges and universities and minority institutions. The program will return for the 2014-2015 academic year.



continued from **page 1**

internships all geared toward encouraging young scholars to enrich their science, technology, engineering and mathematics (STEM) education and apply it to the Navy.

One unique way that the department seeks to inspire and educate the next generation of engineers is through student robotics competitions. These competitions have been developed at various academic and skill levels and provide an opportunity for experiential learning. But how do student competitions such as the Office of Naval Research (ONR)-sponsored RoboBoat, RoboSub, SeaPerch and Maritime RobotX Challenge actually help direct and sustain this flow of STEM talent into the Navy career workforce?

### MINDS AND HANDS – EXPERIENTIAL LEARNING

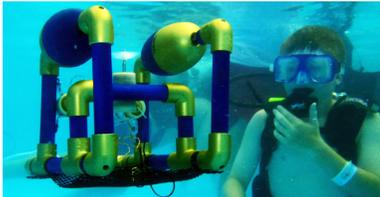
They do so by tying hands-on, experiential learning with mentoring and real-world problem solving alongside naval scientists and engineers. ONR, along with the most prestigious science and engineering universities in the country, has long recognized that hands-on, experiential learning is a necessary component of education and training. In addition to teaching theory, universities continuously engage students to set up experimental equipment, design and construct prototypes, participate in tasks with industry partners, and execute long-term scientific endeavors specifically to solve real-world problems by applying the latest technologies in innovative ways. This experiential learning is the foundation of students' confidence in understanding the theory they have been taught and in their individual ability to transform theoretical knowledge into a practical solution.

To an even greater degree, competitive experiential learning

develops many desirable qualities in students. In RoboBoat, RoboSub and the Maritime RobotX Challenge, the uniqueness of the contests requires more than one scientific specialty or technical field. To achieve the competition's goals, students educated in various science and engineering fields, students from different cultural backgrounds and students of widely varying skill levels must learn to work together to meet a single objective. Performing as a team under the firm pressure of competition requires students to organize themselves and work together effectively, to re-investigate intricate details of theory (or develop entirely new theories), to cultivate extensive technical communication skills and, for many, to acquire leadership competencies for their coming professional lives. Student competitions teach self-reliance and jump-start innovation, as well as encourage intelligent risk taking. Competitions demand practice and practice develops skills. These skills translate to success later in their professional lives with the Navy.

The Navy conducts student competitions to attract the widest range of students to opportunities for a satisfying professional life filled with meaningful challenges and interesting work. Student competitions sharpen STEM skills and teach students to work in technical groups toward an objective within a definite timeline. RoboBoat, RoboSub, SeaPerch and the Maritime RobotX Challenge competitions stimulate interest in the Navy and Marine Corps, provide essential experiential learning for student preparation and simultaneously develop new applications of technology—all of which underpin the future technological superiority the Navy must maintain to defend the country at sea.

## ROBOTICS COMPETITIONS



**SEAPERCH:** SeaPerch is an underwater robot that students build while engaging in a curriculum that teaches basic engineering and science principles, problem solving, teamwork and technology with a marine engineering theme. The 2014 National SeaPerch Challenge will be held at the University of Southern Mississippi in Hattiesburg, Miss., on May 17 where up to 100 SeaPerch teams are expected to compete.

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An up-close view of a Scout swimming with a SeaPerch decorated in the blue-and-gold of the U.S. Naval Academy. (Photo courtesy of Olympus Camera)



**ROBOSUB:** RoboSub advances the development of autonomous underwater vehicles by challenging a new generation of engineers to perform realistic missions in an underwater environment. The Space and Naval Warfare Systems Center Pacific's Transducer Evaluation Center in San Diego hosts the annual event which will be held July 28-Aug. 3.

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A team member from Amador Valley High School in Pleasanton, Calif., swims with his team's RoboSub during the 16th International RoboSub Competition at the Transducer Evaluation Center pool on Point Loma Naval Base. (U.S. Navy photo by Mass Communication Specialist 3rd Class Katarzyna Kobiljak)



**ROBOBOAT:** Student teams race autonomous surface vehicles of their own design through an aquatic obstacle course that simulate realistic missions vehicles in the maritime environment. The 7th annual RoboBoat competition will be held July 8-13, in Virginia Beach, Va.

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The boat from the University of Michigan makes a practice run during the 2013 AUVSI Foundation and Office of Naval Research's 6th annual international RoboBoat competition held at the Founders Inn and Spa, Virginia Beach, Va. (U.S. Navy photo by John F. Williams)



**MARITIME ROBOTX:** The Maritime RobotX Challenge is sponsored by the Office of Naval Research and organized by the Association for Unmanned Vehicle Systems International Foundation. Fifteen teams of students from the United States and four Pacific Rim countries will use a standardized vessel provided by competition organizers to outfit with propulsion, power, sensors and control systems in Singapore, Oct. 20-26.

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The Smaller Wave Adaptive Modular Vehicle that all the teams will use as their platform for this autonomy competition. (Photo by Mar Inc.)

# ABOUT STEM2STERN

**S**TEM2Stern is the Department of the Navy's science, technology, engineering and mathematics (STEM) Initiative. Under the leadership of the chief of naval research, who serves as the Naval STEM Executive, STEM2Stern works with the naval system commands, laboratories, warfare centers and other research and education institutions to leverage resources and maximize the impact of the department's STEM investments.

These investments support a wide variety of STEM educational programs, ranging from activities designed to spark younger students' interest in STEM careers, to more in-depth, hands-on learning opportunities for middle and high school students, internships and research fellowships for older high school and post-secondary students and professional development opportunities for naval STEM professionals and faculty.

**STEM2Stern.org** provides information about STEM projects sponsored by the U.S. Navy. This includes recent news about the programs, as well as specific program descriptions and success stories. Visit **STEM2Stern.org** to learn more!

To contact the STEM2Stern office, send emails to [info@stem2stern.org](mailto:info@stem2stern.org)



## STEMtistics

- Technological innovation has produced roughly half of all economic growth in the United States over the last 50 years. (National Science Foundation [2004])
- During the next decade, demand for scientists and engineers in the U.S. is expected to increase at four times the rate than all other occupations. (Georgetown University Center on Education and the Workforce publication Help Wanted: Projections of Jobs and Education Requirements Through 2018 [June 2010])
- The Department of the Navy employs almost 100,000 uniformed and civilian scientists, engineers and technicians in science, technology, engineering and mathematics (STEM) occupations. (Navy Total Force Workforce Analysis)
- By 2020, more than half of Department of Defense STEM professionals will be retirement eligible. (Seng, Institute for Defense Analysis [2009])
- Only 36 percent of all 18- to 24-year-olds are actually enrolled in post-secondary education. (Change the Equation STEM Vital Signs Report)
- Only 17 percent of 12th graders are both interested in STEM careers and proficient in math. (The STEM interest and proficiency challenge: Creating the workforce of the future [2011 Business-Higher Education Forum])
- The United States ranks 20th among all nations in the proportion of 24-year-olds who earn degrees in natural sciences or engineering. (National Science Foundation)
- In comparison to their non-STEM counterparts, STEM workers earn 26 percent more on average and are less likely to experience joblessness. (STEM: Good Jobs Now and for the Future, U.S. Department of Commerce, Economics and Statistics Administration)



## IMPORTANT STEM DATES FOR 2014

### FIRST Championship

April 23-26  
St. Louis, Mo.  
[www.usfirst.org](http://www.usfirst.org)

### SeaPerch National Challenge

May 17  
Hattiesburg, Miss.  
[www.seaperch.org](http://www.seaperch.org)

### New York Fleet Week

May 20-27  
New York, N.Y.  
[www.fleetweeknewyork.com](http://www.fleetweeknewyork.com)

## NAVAL STEM WEBSITES AND SPONSORED ACTIVITIES

Below is a list of websites you may find interesting. It includes Web addresses for various naval programs, as well as some of our signature program partners.

[www.usna.edu/STEM](http://www.usna.edu/STEM)  
[www.seaperch.org](http://www.seaperch.org)  
[www.iridescentlearning.org](http://www.iridescentlearning.org)  
[www.goorulearning.org](http://www.goorulearning.org)  
[www.ndep.us](http://www.ndep.us)  
[seap.asee.org](http://seap.asee.org)  
[nreip.asee.org](http://nreip.asee.org)  
[www.nmsi.org](http://www.nmsi.org)  
[www.dodstarbase.org](http://www.dodstarbase.org)  
[www.usfirst.org](http://www.usfirst.org)



[www.stem2stern.org](http://www.stem2stern.org)