

2021-2022

NATIONAL JUDGING
& EDUCATIONAL EVENT

WASHINGTON, D.C. | JUNE 27 - JULY 1

NJ&EE AWARDS
YEARBOOK



ACCEPT THE CHALLENGE



#ecyber22 | ecybermission.com | usaep.com

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CONGRATULATIONS

eCYBERMISSION Finalist Teams!

Congratulations, eCYBERMISSION Finalist Teams!

Welcome to the Omni Shoreham Hotel and the National Judging and Educational Event Awards Luncheon. This prestigious event marks the culmination of the 2021–2022 competition year, and eCYBERMISSION's 20th competition year, a significant milestone for the U.S. Army Educational Outreach Program's eCYBERMISSION.

Throughout this year, each of you accepted the eCYBERMISSION challenge and progressed through both state and regional competitions. As National Finalists and science, technology, engineering and mathematics STEM-in-Action award recipients, you were afforded the opportunity to participate in STEM enrichment activities, visit our Nation's capital, and tour some of the historical centerpieces in Washington, D.C. We hope you have enjoyed your experience this year with eCYBERMISSION.

Your achievements set you apart from the 2,626 teams competing this year—a true testament to your dedication, enthusiasm and quest for knowledge. Your outstanding efforts embody the U.S. Army's vision for providing a STEM education and career path. You should be proud.

As eCYBERMISSION concludes its 20th year of STEM innovation and inspiration, we recognize the ever-increasing need for student engagement in STEM education. During this week, you've had the opportunity to meet some of the best and brightest U.S. Army scientists, technologists, engineers

and mathematicians. I challenge you, the next generation of scientists and engineers, to continue exploring STEM opportunities which contribute to making our communities, our Nation, and our world a better place.

I am honored to be involved with this group of our Nation's brightest students whom I know will make a difference in our country. As you continue on with your education, please remember the opportunities offered through the U.S. Army Educational Outreach Program [AEOP], eCYBERMISSION, and the exciting challenges awaiting you as you pursue a STEM career path.

On behalf of the U.S. Army and the entire eCYBERMISSION team, I congratulate you on your outstanding achievements!

Sincerely,



Jeffrey D. Singleton

Official Host

Director for Technology

Office of the Assistant Secretary of the Army Acquisition, Logistics & Technology [ASA-ALT]

eCYBERMISSION

Accept the Challenge

eCYBERMISSION is a free, online science, technology, engineering, and mathematics [STEM] competition for students in grades six through nine that promotes teamwork, self-discovery, and the real-life applications of STEM. Students work in teams of two to four, with the help of an adult Team Advisor, to choose a problem in their community to explore with science or solve with engineering. Throughout the competition, students work on team building and interact with STEM professionals while competing for state, regional, and national awards that can be used for future education.

Teams making it to the National Judging & Educational Event [NJ&EE] are a leading group that demonstrated a strong understanding of STEM subjects, aptly applying what they have learned in the classroom to a real-life problem in their community.

eCYBERMISSION is part of AEOP, the Army Educational Outreach Program, which is committed to answering the Nation's need for increased STEM literacy and to expanding STEM education opportunities across the country to open doors to new career paths for American students. eCYBERMISSION is administered by the National Science Teaching Association [NSTA].

THIS YEAR...

8,490 students participated in eCYBERMISSION from **285 schools**, of which **7 are DoDEA**.

385 team advisors participated this year, most of whom are math and science teachers.

A total of **2,626 teams**, located in **42 states and territories**, participated in this year's competition.

There were **125 first-and second-place winning teams** at the state level, and **58 teams** advanced to the regional competition.

65 students on 21 teams are National Finalists or STEM-In-Action Grant winners at this year's virtual National Judging & Educational Event [NJ&EE].

5 teams (4 of which are also National Finalists) are STEM-In-Action Grant winners.

2,156 Volunteer Virtual Judges, 22 Regional Judges, 10 National Judges, and 11 STEM-in-Action Judges volunteered their time to review the Mission Folders, listen to the Regional Judging presentations, and review the STEM-in-Action Grant proposals.

6TH GRADE FINALIST TEAMS

6TH GRADE FINALIST TEAMS



CLOUDY WITH A CHANCE OF ROBOTICS

STEM-IN-ACTION GRANT RECIPIENTS

SCHOOL: Bananas Robotics, Inc., Eagle, Idaho

TEAM MEMBERS: Kashvi Bansal, Rishi Gajera

TEAM ADVISOR: Raj Bansal

PROJECT SUMMARY: During a volunteer trip at the Idaho Foodbank, we realized that they get many donations, but often lack the volunteers to sort them. They also have a community outreach program to educate the population on nutrition, but it was halted due to COVID-19. Our team will attempt to solve two problems in the community relating to food insecurity and making healthy choices. The first one is to address the shortage of volunteers at the Foodbank to sort food into categories. The second one is to help people make healthy choices while choosing packaged food. Our final product should assist volunteers to increase their productivity and efficiency while reducing the mental stress involved with sorting food. After doing research on food sorting problems and nutrition-based decision making, we realized that reading and categorically analyzing the content of nutrition labels could be a possible solution. Learning about computer vision and OCR technology helped us get confidence to devise the solution. Once the data has been effectively read by the computer, it can be used to make more decisions such as classifying the food as healthy or unhealthy by nutrition guidelines. Progress on this project was presented to the leaders in the community at the Idaho Foodbank, the governor's office, and the secretary of state. We were happy to receive positive feedback and letters of appreciation.



OH, DEER!

SCHOOL: St. Richard Catholic School, Jackson, Mississippi

TEAM MEMBERS: Benjamin Manhein, Neel Boteler, Maley Thornhill, Lily Frances Garner.

TEAM ADVISOR: Ashley Klein

PROJECT SUMMARY: Deer-vehicle accidents cause widespread property damage, bodily injury, and loss of life. They happen a lot in Mississippi, 3,700 times a year, with almost everyone in our community survey stating they know someone involved in a DVA. After a recent, jarring collision with a deer, we learned that lesson first-hand. We wanted to prevent these accidents. Existing deer warning devices become ineffective over time. Deer grow accustomed to the sounds of devices, like deer whistles, and learn to ignore them. After studying deer senses, we quickly realized targeting hearing and vision provided the best warning because light and sound carry over a distance. Research revealed deer senses differ from human senses in two critical ways. Deer see the blue end of the light spectrum and UV light better than humans do. They also hear best in a frequency range higher than humans. By leveraging the differences between human senses and deer senses, we created a deterrent for deer with minimal distractions to human drivers. We programmed our device, the Steer Deer Clear (SDC), to produce varying light and sound signals so deer do not become familiar with them. After observing a deer camp with a feed plot, we noticed a substantial number of deer present daily. We tested the SDC there. When we turned the SDC on, the deer completely stayed away over a full week. When we turned the SDC off, they came back to eat immediately. The Steer Deer Clear works!



RIVER REVIVERS

STEM-IN-ACTION GRANT RECIPIENTS

SCHOOL: Providence Day School, Charlotte, North Carolina

TEAM MEMBERS: Milan Mishra, Margaret Hoffman, Rishab Mishra, Remya Puttagunta

TEAM ADVISOR: Katy Zavesky

PROJECT SUMMARY: Bacterial pollution is a serious problem that impacts rivers around the world, despite control measures taken by governments and other organizations in wastewater management. The lower river basins are especially affected by pathogenic microbes from industrial, agricultural, and animal waste runoff. The beautiful Catawba River basin of the Carolinas is one such example, where swim advisories have become increasingly common due to high *E. coli* presence, prohibiting recreationists from swimming and doing other fun activities. While many solutions exist for cleaning river trash, few exist for river water disinfection from bacterial contamination, which involves chemical processing which, although effective, can create other hazards, like producing secondary waste and harming marine life. Our proposed solution of using UV radiation technology built into a self-navigating, unmanned surface utility vehicle (SUV) can prove to be the answer to a chemical-free, environmentally friendly, economic, and sustainable solution. Research shows that most beneficial bacteria are found near the bottom of lakes and rivers where the marine ecosystem thrives, whereas the fecal bacteria attach themselves to floating particles on the surface waters. UV light is already used for water purification in households, industries, and aquariums, so using it in the right range and wavelength will effectively inactivate the bad bacteria without harming the good bacteria. As we continue to work on our mission, we aim to get support from environmental protection advocates so that our prototype can evolve into successful remediation of river water contamination to be used widely.



TEEM

SCHOOL: Bay Sea Scouts, Inc., Bay Village, Ohio

TEAM MEMBERS: Becket Tumney, Orion Riddell, Addison Graham

TEAM ADVISOR: Richard Gash

PROJECT SUMMARY: Our project centered on evaluating the health of Cahoon Creek, a stream that runs through the center of Bay Village to Lake Erie. We used observation of the water flow, sedimentation, turbidity, chemical analysis, readings of nitrate and phosphorus concentrations, dissolved oxygen and pH, and collected macroinvertebrates. The results compared with the recommendations of the E.P.A. were found to meet or exceed their standards. The E.P.A. has the Cahoon Creek listed as "impaired" on their website, but with our use of STEM in hydrology, chemistry, and mathematics, we have proved them wrong at this present time. It is very important to our community to know the health of Cahoon Creek for recreational and commercial purposes. Sports fields and walking paths surround the creek in Bay Village, and, on the commercial side, a healthy stream affects real estate values as it passes through housing areas further upstream. To alert the community to our findings, we plan to write an article for the Westlake/Bay Village Observer explaining our positive results.



MYCO-RISERS

STEM-IN-ACTION GRANT RECIPIENTS ONLY

SCHOOL: Navy Elementary School, Herndon, Virginia

TEAM MEMBERS: Yuvaan Yellepeddy, Graham Naughton, Aditya Nandimandalam

TEAM ADVISOR: Murali Yellepeddy

PROJECT SUMMARY: We are all aware, eating right is important for our overall health and we have been brainwashed to eat unhealthy food by depicting the unhealthy food as tasty. Well guess what, that is exactly what is happening to our soil as well. We are being brainwashed to think that the grass lawns look great and each one of us should have a well-manicured lawn. That is extremely unhealthy to the soil and the environment. Lawns contribute to 5% of the pollutants in this country and are a big cause of soil health degradation. Plants such as clover and dandelion have been marketed as weeds and are not weeds and do a ton of good to the soil health.

To understand the health of soil, it is more important to understand the biology of the soil. A balanced biome is essential for a healthy soil. By understanding the biology, we can come up with more regenerative ways to fixing soil health.

7TH GRADE FINALIST TEAMS

7TH GRADE FINALIST TEAMS



CONCRETE CAPTAINS

SCHOOL: Parent Led, Scottsdale, Arizona

TEAM MEMBERS: William Parsons, Eric Wang, Aditya Vashistha, Charles Skidmore

TEAM ADVISOR: Audrey Skidmore

PROJECT SUMMARY: Today, members of the community, especially disabled individuals, constantly face the risk of falling due to bad concrete when using sidewalks. We asked ourselves, how can we help these members of the community have better access to the community? Our solution was to design an app with a crowdsourced map of bad sidewalk conditions, and allow users to find safe routes and avoid bad concrete. An interview with a professional software designer revealed that the first step in this process was to create a wire flow. We created a wire flow and surveyed members of the community on it. Our survey revealed a handful of issues, enhancements, and shortcomings that led us to revise our design. Our survey demonstrated a clear need and demand for our app. We have a clear idea of what direction this might take in the future. Mr. Christenson, Vice President of Community Integration at Ability360, expressed interest in our idea and we would like to partner with professional app engineers, like those at the ASU Cloud Innovation Center or a similar organization, to actually create the app, which will make the community a better, safer place for everyone.



PATTON-ERVIN

SCHOOL: Canterbury School, Fort Wayne, Indiana

TEAM MEMBERS: Nadia Patton, Casey Ervin

TEAM ADVISOR: Joseph Caldwell

PROJECT SUMMARY: We did a project about how fast and high tulips grew with different amounts of water, as well as which tulips' roots grew the most at the end of the project. We believe the tulip bulb that we water with 1/3 cup of water will grow the fastest because it is not too much or too little water for the plant to grow. In order to plant the tulips, we needed three pots, tulip bulbs, soil, measuring cups, scissors, towels, paper, pens, and water. We planted the tulip bulbs in moisture-controlled soil, put a towel underneath it to prevent leaking, and watered all tulips different amounts of water on Thursdays for a prolonged amount of time and wrote down the results. About halfway through, we noticed the plant that was given 1/6 cup of water started to decompose and began losing biomass. The soil also began to let more water through as we watered the plants more and this allowed for the conclusion to change a lot from the halfway mark growth. Aboveground results showed that the tulip with 1/3 cup of water grew the most, in second was 2/3 cups of water, then 1/6 cups of water. Below ground results were different, where 1/6 cups of water lost weight, the 1/3 cups of water grew slightly, and the 2/3 of water grew rapidly and stopped.



PLASTIC PATROL

SCHOOL: Southcrest Christian School, Lubbock, Texas

TEAM MEMBERS: Jett Hurst, Annerson Dooley

TEAM ADVISOR: Laura Stary

PROJECT SUMMARY: Plastic pollution is threatening ecosystems around the globe and the health of everyone on this planet. Of critical concern is the physical breakdown of plastic into tiny <5 mm pieces known as microplastics. The oceans are powdered with this residue and its negative impacts.

It was time for innovative thinking and alternatives to "trash pick-up days" that are not possible when dealing with MICROplastics. Reinventing the way to fight this waste resulted in the use of algae as bio-accumulators. Ten marine and freshwater species of algae were tested in habitats with microplastics. The algae were fed, multiplied, and observed daily for eight weeks. Microscopy showed two freshwater species (*Vaucheria* and *Lyngby*) and two saltwater species (*Polysiphonia* and *Callithamnion*) were able to hyper-accumulate microplastics from water and contain them.

A third investigation measured the temperature of sand with microplastics. The result was a decrease in the sand's temperature. Reptiles such as sea turtles rely on specific nest temperatures for egg viability and gender determination. Working with The Institute of Environmental and Human Health led us to a study of the cellular effects of microplastics on hawksbill sea turtles.

The solution using algae to clean water is a low-tech system designed to be scaled for global application. Algae is a sustainable solution and could rejuvenate natural systems in hot spots. The use of STEM to solve the problem of microplastics means waste management is optimized in an efficient and cost-effective method.



STOPFIRE BRIGADE

STEM-IN-ACTION GRANT RECIPIENTS

SCHOOL: Andover West Middle School, Andover, Massachusetts

TEAM MEMBERS: Matthew Wang, Sean Conner

TEAM ADVISOR: Kelly McDonald

PROJECT SUMMARY: Due to the effects of climate change, scientists are predicting that Massachusetts will see more wildfires over time. In 2021, the state had approximately 796 wildfires which threatened over 300 homes and the lives of the residents living nearby. Currently, in our community, fire detection is done using watchtowers. Unfortunately, that requires that the smoke from the fire rises high enough over the tree canopy so that it can be seen, and that may be too late to save lives. The focus of this project is to create a smoke detection system that can alert users to smaller fires much more quickly and send an alert message with the exact GPS location of the fire.

STEM played a critical role in developing the prototype. The prototype was built using Arduino technology. It was designed to detect smoke from a fire, use GPS coordinates to detect the exact location of the fire, and send a text message to officials and community members living nearby. TinkerCAD and a 3-D printer were used as well to create a covering to protect the Arduino components so that it could be used outside in wooded areas. The community fire warden helped test out the prototype, simulating a real-life wildfire in a controlled setting. The prototype met expectations and the warden recommended use of the prototype for residents living near wooded areas. With an increasing number of wildfires expected in Massachusetts over time, this detection system may be able to save lives in our community.



TEAM ASTROSTEM

SCHOOL: Ocean Bay Middle School, Myrtle Beach, South Carolina

TEAM MEMBERS: Leyla Unerli, Briana Stephens

TEAM ADVISOR: Denise Wright

PROJECT SUMMARY: In this project, we used STEM to create the Hydro Tec Planter, a planter that allows people in our local community to grow more produce in a small space to be consumed, which results in a substantial number of vegetables and fruits grown in an area. The amount of arable land is limited, and our project helps people grow more fruits and vegetables, despite the sandy land and without wasting water. We used science in our project by using pH and moisture sensors. We used technology in our prototype with the use of the robot and the code that runs it. We used engineering in the process of how we created the overall prototype. Finally, we used math to detect the pH and calculate how much nutrients needed to be added for a certain amount of water to make sure that we have produce for people to enjoy and to have for nourishment.

8TH GRADE FINALIST TEAMS



VISION

SCHOOL: Mountain Heights Academy, Tooele, Utah

TEAM MEMBERS: Weston Bruderer, Makaela Gibbons, Rockland Stout

TEAM ADVISOR: Lora Gibbons

PROJECT SUMMARY: There are over 45 million people in the United States wearing contact lenses and those individuals have a nearly nine times greater likelihood of getting bacterial keratitis, which is an infection of the cornea, or the clear dome that covers the eye. We focused our research on *Pseudomonas* which is one of the most common bacteria causing bacterial keratitis. It's very painful, can lead to blindness, and contact lens use is a major risk. The CDC estimates keratitis can result in over one million doctor visits per year and cost over \$175 million dollars in health care expenses. Our mission was to use STEM practices to find a solution to stop this infection caused by *Pseudomonas* bacteria. We began our investigation using modern technology to isolate nine new bacteriophages specific to *Pseudomonas*. After isolation, we tested whether these phages would be stable within a contact lens solution. Finally, we identified the host range for the phages that were isolated by testing their effectiveness against other bacteria similar to *Pseudomonas*. We discovered through many months of investigation that the nine identified bacteriophages were extremely stable in contact lens solution and lost no effectiveness over a month of trial. Seven of the nine phages were specific only to *Pseudomonas*, making them narrow range and a good fit for our phage contact lens solution. Ultimately, as we share our research and innovation our hope is that our Vision solution will help the over 45 million people who wear contact lenses.



OMg

SCHOOL: Francis Granger Middle School, Aurora, Illinois

TEAM MEMBERS: Nidhi Sagaram, Samil Sharma, Viraj Vyas

TEAM ADVISOR: Aruna Rao

PROJECT SUMMARY: According to the World Health Organization, over 75% of Americans fail to reach their recommended magnesium intake. This is due to over-cultivation, use of chemical-heavy fertilizers, and lack of natural ways to replenish the soil with nutrients. Plants absorb micro and macronutrients from the soil. Magnesium is the central chemical of chlorophyll and a lack of it brings down the quality of photosynthesis, leading to stunted plants and discolored leaves/fruits. When the plants don't have enough magnesium, it doesn't get passed on to humans who consume it. Since magnesium is only available in plant products, this is an alarming problem needing immediate attention. The indirect costs of diseases related to magnesium deficiency in the US are approximately \$712.3 billion. Magnesium deficiencies can cause abnormal heart rhythms, muscle spasms, numbness, anxiety/depression, seizures, diabetes, fatigue, and osteoporosis, amongst others. What we learned during research was shocking! Many in our community were

magnesium deficient and doctors were routinely prescribing medicines to fix the issue. We took it upon ourselves to get to the root of this problem. We designed and conducted experiments to study the problem. We potted thirty-one plants and applied several natural magnesium-rich materials like composted manure, Epsom salt, and Dolomitic lime. After several rounds of testing, we determined a cost-effective and eco-friendly combination of composted manure and Epsom salt in a certain proportion to be the right answer for this problem. We shared our findings with farmers/growers, nutritionists, and soil experts amongst others in our community.



COUNTERFEIT CATCHERS

SCHOOL: Southcrest Christian School, Lubbock, Texas

TEAM MEMBERS: Noah Bueermann, Emily Forbes, Matthew Nall, William Oswald

TEAM ADVISOR: Laura Stary

PROJECT SUMMARY: As a member of a Native American tribe, I understand that the need for respect and preservation of a tribe's culture is one of the most critically threatened elements of Native life. The Navajo Nation is the largest tribe in the country. Although known for their exquisite weavings, today, counterfeit pieces are made in other countries, then brought here and sold as authentic Navajo rugs. Falsifying Native art robs people of their pride, value, and culture. Counterfeit Catchers used STEM to find ways of detecting fraud and authenticating weavings using pH tests, UV lights, forensics, and physical characteristics of textiles. During testing, pH levels of commercial dyes were higher than natural dyes made from regional plants and cochineal beetles. Natural indigo dyes fluoresced under UV lights, while the synthetic indigo of falsified rugs did not. Conducting forensics tests on tiny pieces of fiber removed from rugs involved burn tests used to authenticate Native art using smell, ash, and burn time. Finally, methods used in crafting rugs left behind signs that, to a trained eye, distinguished authentic rugs from fakes. Experts in Navajo art taught the team to identify warps, wefts, and patterns of symmetry unique to Navajo weavings. STEM was successfully used to distinguish between counterfeit and real Navajo textiles. A brochure and kits were assembled and distributed to galleries and art dealers to aid in identification of counterfeit pieces. STEM is the beginning of restoring value to Native art and preserving the culture seen through iconic Navajo weavings.

8TH GRADE FINALIST TEAMS



AO HYDRO HEROES

SCHOOL: Rachel Carson Middle School, Herndon, Virginia

TEAM MEMBERS: Aashritha Penumudi, Zoha Siddiqi, Ria Goel, Riya Sri Nagella

TEAM ADVISOR: Saritha Ventrpragada

PROJECT SUMMARY: We, the AO HydroHeroes, have investigated the issues of ocean acidification and oil spills. Ocean acidification is the result of an increasing amount of carbon dioxide being absorbed by the ocean. Oil spills are the result of human error and mishaps at locations such as oil rigs. We researched using online resources and news articles to learn more about the history of these issues. Currently, there are no solutions for ocean acidification, and the solutions for oil spills are either ineffective or negatively impact the environment. After analyzing what is being done to solve these issues, we hypothesized that using magnesium would reduce the acidity of water, while raw cotton and petrogel would absorb oil. After experimentation, we concluded that ¼ teaspoon of magnesium reacted with the hydrogen ions within the water to neutralize the acidity, increasing the pH value of the water. The natural hydrophobic properties of the cotton were beneficial when absorbing the oil, and the petrogel worked as a second barrier to further prevent water from penetrating into the mesh bag. After organizing these materials into dissolvable bags and mesh pouches, we were able to absorb most of the oil from the containers, as well as increase the pH value of the water to a healthy range of 8.3. In the future, we would like to experiment with crude oil to verify our results in a real environment, and also implement our solution in local areas such as Virginia Beach.



SUPERNOVAS

SCHOOL: White Station Middle School, Memphis, Tennessee

TEAM MEMBERS: Amy Yu, Pragna Rajashekar, Daniel Lam, Garrett Chaudron

TEAM ADVISOR: Rebecca Reed

PROJECT SUMMARY: Our project was an experiment to see if less time spent on social media and games led to less stress, which we defined as better focus, less trouble keeping up in classes, and more sleep. For one week, we asked 50 participants to track their usual usage of social media and online games and feelings of stress. At the end of the week, the participants were told to record their results in the pre-intervention survey for base-line information. We then split the participants into two groups: the experimental group, who were asked to reduce their time, and the control group, who continued their usual usage. After a week, we sent out the post-intervention survey, and we compared changes between the participants who reduced their time and those who did not. By creating both the pre- and post-intervention surveys, we applied engineering and technology to our experiment. We then applied mathematics to our experiment by comparing the data of the participants who decreased their total time and others who had not. We also used science to draw conclusions from our findings. From analyzing the data, we found that reducing the amount of time spent on these digital interactions decreased the amount of stress. Some participants who reduced their total time even reported feeling better, while none in the control group did. These findings can help individuals feel less stressed, which effectively improves our community.

9TH GRADE FINALIST TEAMS



H2O

SCHOOL: Moanalua High School, Honolulu, Hawaii

TEAM MEMBERS: Jeriko Jezza Freirez, Kyla Yoshizawa, Jennifer Chung, Brennen Carreira

TEAM ADVISOR: Nicole Nakasuji

PROJECT SUMMARY: Wasting food is a waste of energy, water, carbon, and labor, so it is important for communities to find ethical ways of reducing food waste. This team wanted to investigate if using different soil to food scraps ratios will lead to faster composting. Three compost bins were created per family, holding different amounts of soil with the same amount of brown waste and food waste. The compost bins' layers were created, the entire compost bins were weighed, and the weights of the composts were recorded. It was found that 0:1 soil to food waste had a final increase in weight of 26.7%, 2:1 soil to food waste had a 25.7% increase, and 4:1 had an increase of 19.3%. These data were used to determine which compost was the most effective. The weight increase of the compost represents how much/how efficiently the food decomposes in each ratio. As the food decomposes, it releases moisture which adds more weight to the compost, so, the more it decomposes, the heavier it will be. In the end, soil was not as effective in breaking down food scraps; 0:1 soil to food waste had the highest percent weight increase compared to other bins. Using what was found, this will help to encourage composting, as it benefits the environment by recycling organic materials. This team plans to encourage composting by posting the results of which ratio decomposes the quickest online after necessary retesting of this experiment is done.



PADS FOR THE PLANET

SCHOOL: Isthmus Montessori Academy, Madison, Wisconsin

TEAM MEMBERS: Moth Matthews, Mercy Felt, Redd Lain, Zaina Zaki

TEAM ADVISOR: Jyotsna Malineni

PROJECT SUMMARY: We looked at our classroom community and recognized the problem of how much menstrual product waste we produce. While this problem is relevant to our class, it is also relevant to the entire world. Usually, people gravitate towards easy solutions. However, sometimes the easiest way isn't the best way, especially not for our planet. In the lifetime of only one woman, she can use up to 16,000 pads. Imagine the magnitude of the problem.

We came up with multiple ideas on how to help fix our community problem. We thought about making reusable tampons, but we learned that reusable tampons can be harmful to the body. After doing some research, we decided on making reusable pads. We gathered information about reusable pads from

experts in the field, then we moved onto making our first prototype. We tried multiple ways of making our product, but in the end we chose the one that was the most functional and the most comfortable.

We are planning on providing reusable pads for learners in our school and leave some as an option in our restrooms. Our hope is that they will open up to the idea and try our pads.

We are also planning to speak to our community members about our research and bring awareness towards the problem. We hope that the message will start spreading outwards and more people will switch to a more resourceful method.



BIOCHANGE

SCHOOL: Science Rocks U, Lubbock, Texas

TEAM MEMBERS: Caleb Cole-Smith, Caitlyn Cole-Smith

TEAM ADVISOR: Kimberly Cole

PROJECT SUMMARY: One of the United Nations' Global Goals was to reverse the loss of forest cover worldwide, including through sustainable forest management through protection, restoration, afforestation and reforestation. With this in mind, Biochange was aware of the effects of destruction after wildfires and the need for more rapid restoration. Biochange learned of biochar and its rich nutrients and determined to use existing resources to see if germination and reforestation could be rapidly increased.

Alongside national and international community partners, and with university mentors, we initially tested biochar on three specific soils we developed to match soil characteristics from wildfire-impacted areas: Brazil, California and Australia.

Seeds were planted in the soils and enhanced with various percentages of biochar. The results demonstrated that biochar was effective in promoting germination. Our next investigation was to increase the speed for germination through hydroponics. Our first investigation used biochar, compost tea, a combination of both, and a control. The biochar showed germination almost immediately but compost was not conducive to a hydroponic system. A secondary investigation utilized biochar tea, earthworm casting tea, a combination, and a control. The biochar continued to enhance germination throughout tests in soil and hydroponics.

Community outreach included flyers, posters, a website, and meeting with soil experts to spread the word about the benefits of using biochar following wildfires. Those in positions of leadership were targeted in the hopes of creating the greatest possible impact in areas around the globe.

9TH GRADE FINALIST TEAMS



BUSY BEE TECH

SCHOOL: High Tech High School, Secaucus, New Jersey

TEAM MEMBERS: Ambika Rao, Romayssae Saidi

TEAM ADVISOR: Shelly Witham

PROJECT SUMMARY: In the beginning of the COVID-19 pandemic, our high school endured through the loss of its bees. The question remains unanswered on why the bees disappeared. Apirists are unable to have a strict and constant monitoring system for their bees. Restrictions like the weather, less annoyance on the bees, or being incapable to be present are a few obstacles beekeepers encounter. If the school had a smart beehive system, they would be able to identify the issue and take proper action to return the hive to its proper state. Bees are not only important for ecological reasons, but also for social and economic development of rural and urban communities. Smart beehive systems are a solution that already exists. However, how much energy are they utilizing to function? How remote can the sensors provide a reading, and how affordable are they? These are factors that will be implemented in our model. Through our research, we discovered that the four important sensors that should be in a smart beehive should be temperature, humidity, weight, and sound via remote microphone. Our solution and process demonstrates a multi-sensor platform designated to measure key components and make a greater impact inside the colony and the community.



CHALLENGERS

SCHOOL: Greenbrier Middle School, Evans, Georgia

TEAM MEMBERS: Peyton Phillips, Noah Brown, Damien Bush, Nolan Toney

TEAM ADVISOR: David Phillips

PROJECT SUMMARY: Team Challengers decided to tackle the issue of afforestation because, during a virtual meeting and the meeting with the aeronautical student, some members of our team started to realize how important it would be to be able to plant vegetation in difficult to reach areas as well as how important it would be to preserve the environment, which is much more crucial for humans and animals alike as opposed to launching payloads into space. After much convincing and deliberation, we all settled on utilizing aircraft to drop tree seeds or saplings on the ground, which would then grow into trees. This solution allows us to restore vegetation to areas that are either difficult to access or inaccessible altogether and is much quicker than individually planting every tree.

Our project was structured in its entirety by STEM. The use of aerodynamics, 3D design, electronics, and agriculture are all in STEM. All aspects of STEM go straight into the advancement of our community as a whole. Our team hopes that every single one of these projects, designs, ideas, and ideals that this competition creates will one day change the world. Every submission is an attempt to do so, and every attempt means that there are people out there willing to do it.

STEM-IN-ACTION GRANT RECIPIENTS

SCHEDULE AT A GLANCE

6TH GRADE TEAM



RIVER REVIVERS

SCHOOL: Providence Day School, Charlotte, North Carolina

TEAM MEMBERS: Milan Mishra, Margaret Hoffman, Rishab Mishra, Ramya Puttagunta

TEAM ADVISOR: Katy Zavesky



MYCO-RISERS

SCHOOL: Navy Elementary School, Herndon, Virginia

TEAM MEMBERS: Yuvaan Yellepeddy, Graham Naughton, Aditya Nandimandam

TEAM ADVISOR: Murali Yellepeddy



CLOUDY WITH A CHANCE OF ROBOTICS

SCHOOL: Bananas Robotics, Inc., Eagle, Idaho

TEAM MEMBERS: Kashvi Bansal, Rishi Gajera

TEAM ADVISOR: Raj Bansal

7TH GRADE TEAM



STOPFIRE BRIGADE

SCHOOL: Andover West Middle School, Andover, Massachusetts

TEAM MEMBERS: Matthew Wang, Sean Conner

TEAM ADVISOR: Kelly McDonald



THE RESOURCEFUL ROOKIES

SCHOOL: Christ, Prince of Peace Catholic School, Manchester, Missouri

TEAM MEMBERS: Joshua Diehl, Kyle Newman, Aubrey Davis

TEAM ADVISOR: Joan Patton

DATE

ACTIVITY

SUNDAY,
JUNE 26

- > Team Arrival & Check-in
- > Welcome Dinner

MONDAY,
JUNE 27

- > Team Orientation
- > "Let's Move" U.S. Army Exercise
- > U.S. Army Values Presentation
- > Alumni Panel

TUESDAY,
JUNE 28

- > U.S. Army Lab Day
- > Student Judging Set Up & Rehearsal

WEDNESDAY,
JUNE 29

- > Zoo Visit & D.C. Bus Tour

THURSDAY,
JUNE 30

- > National Judging
- > National Showcase & People's Choice Award Voting
- > National Awards Banquet Rehearsal

FRIDAY,
JULY 1

- > National Awards Banquet
- > Team Departures

MENTOR BIOS



SFC Curtis Avery
Mentor,
Non-Commissioned Officer (NCO)
U.S. Army Combat Capabilities
Development Command
Headquarters (DEVCOM HQ)

Sergeant First Class Curtis T. Avery Jr is the Higher Headquarters Detachment (HHD) First Sergeant of the U.S. Army Combat Capabilities Development Command (DEVCOM). In this role, SFC Avery serves the senior enlisted advisor to the HHD Commander, a focal point in ensuring mission readiness for all CONUS & OCONUS Soldiers assigned to DEVCOM.

SFC Avery entered the United States Army in January 2009 and completed Basic Combat Training and Advanced Individual Training earning the MOS 13B, Cannon Crewmember, at Fort Sill, Oklahoma.

SFC Avery has served in various positions as a Cannon Crewmember throughout his career, including all positions from cannon crewmember to Howitzer Section Chief with 1st Battalion, 377th AASLT Field Artillery Regiment; Gunner to Gunnery Sergeant with 3-319th AFAR, 1st Brigade Combat Team, 82D ABN DIV; Platoon Sergeant to Operations Sergeant with 4-319th AFAR, 173rd Airborne Brigade; G3 Operations NCO to First Sergeant with the U.S. Army Combat Capabilities Development Command (DEVCOM).

SFC Avery's overseas assignments include a tour in Kosovo and Germany with deployments to Africa, Hungary, Bulgaria and Poland. He has one combat deployment to Iraq in support of Operation Iraqi Freedom and one combat deployment to Afghanistan in support of Operation Enduring Freedom.

SFC Avery's awards and decorations include the Meritorious Service Medal, Army Commendation Medal (4 Oak Leaf Clusters), Army Achievement Medal (1 silver Oak Leaf Cluster and 1 Oak Leaf Cluster), Army Good Conduct Medal (4th award), National Defense Service Medal, Afghanistan Campaign Medal, Iraq Campaign Medal, Global War on Terrorism Service Medal, NCO Professional Development Ribbon with numeral 3, Overseas Service Ribbon with numeral 2, and NATO Medal. SFC Avery has earned Expert Field Artillery Badge, Driver's Badge and the Senior Parachutist Badge, as well as Spanish and Netherlands Parachutist Badges. SFC Avery is also a member the Order of Saint Barbara.



SFC Kishara Fann
6th Grade Mentor,
Non-Commissioned Officer (NCO)
U.S. Army Combat Capabilities
Development Command Army
Research Laboratory (DEVCOM ARL)

SFC Kishara Fann was born and raised in Waterbury, CT before joining the U.S. Army Reserves in 2002. After completing Advanced Individual Training, she chose to go Active Duty. She has served in a variety of assignments and positions throughout her career, including SR Special Electronic Repairer in HAAF, GA from 2006-2012; Army Recruiter in Pottsville/Allentown, PA from 2012-2015; Technical Writer in Fort Lee, VA from 2015-2018; and, beginning in 2018, she is currently the Electronic Maintenance Chief at the U.S. Army Combat Capabilities Development Command Army Research Laboratory (DEVCOM ARL). Her awards and honors include the Army Commendation Medal (7OLC), Army Achievement Medal (4OLC), Afghanistan Campaign Medal, Iraq Campaign Medal, and Army Recruiter Badge. SFC Fann has many goals. Professionally, she hopes to finish her BS with Columbia Southern University and achieve the Lean Six Sigma Black Belt. Personally, she hopes to one day retire from the military and enjoy successes in the civilian workforce, do more volunteer work, learn about investing, and spend more time exploring with her daughter. In her free time, SFC Fann enjoys crafting, reading, and family time.

MENTOR BIOS



Mr. Cole Becker
6th Grade Mentor,
Scientist & Engineer (S&E)
U.S. Army Combat Capabilities
Development Command Armaments
Center (DEVCOM AC)

Mr. Cole Becker grew up in South Jersey in a small town called West Berlin. He graduated from New Jersey Institute of Technology with a Bachelor's in Mechanical Engineering in 2020. From there, he started his career at the U.S. Army Picatinny Arsenal with the System Safety Office under QE&SA. In his free time, Cole loves outdoor activities such as sports, hiking, or fishing. He also enjoys traveling and eating food from all regions.



Mrs. Karla James
7th Grade Mentor,
Scientist & Engineer (S&E)
U.S. Army Test and Evaluation
Command (ATEC)

Mrs. Karla James has worked for the Department of Defense since 2009, under the U.S. Army Test and Evaluation Command. She started her engineering career as a test conductor for missile programs at White Sands Missile Range (WSMR), NM, and then moved to Fort Bliss, TX as the Deputy for the Program Support Division and a Contracting Officer Representative. Karla is currently the Test Officer at WSMR for programs such as Boeing's Starliner Space Capsule, Virgin Galactic, and Spin Launch. She is responsible for command direction, resource management, supervision, and leadership of a team of civilian and contractor personnel engaged in test activities providing technical test program design, planning, test conduct, funds management and reporting. She graduated in 2009 from UTEP receiving a BS in Mechanical Engineering and obtained a Master's degree in System Engineering in May of 2016.



1SG Phillip Tally
7th Grade Mentor,
Non-Commissioned Officer
Army Public Health Center (APHC)

First Sergeant Phillip R. Tally serves as the Senior Enlisted Advisor for Army Public Health Center, Aberdeen Proving Ground, Maryland and First Sergeant for HHC, APHC. He is responsible for the health, morale, and welfare of 105 Soldiers and their Families and serves as the Senior Enlisted Advisor to the APHC Director and HHC Commander for all Soldier matters He assists the Commander in ensuring maximum compliance with medical readiness, training, counseling, inspections, Army programs, and professional development. He oversees the Company's daily operations including accountability, supply, training, and administrative tasks. He manages barracks housing for eight tenant units to ensure safe and healthy living quarters for Soldiers.

First Sergeant Tally is a native of Clayton, North Carolina. He is married to SFC Losivale, Tally (20th CRBN), the father to Andrea Tally (10), Phillip Tally Jr (6) and Madisyn Tally (5). First Sergeant Tally attended Basic Training at Fort Benning, Georgia and complete Preventive Medicine Occupational Skills Advance Individual Training at Joint Base San Antonio, Texas.

First Sergeant Tally's previous assignments include 38 Preventive Medicine Detachment, Yongsan, Korea, Landstuhl Regional Medical Center, Germany, 3rd Battalion, PM NCO at 3rd Special Forces Group, Fort Bragg, Operations NCOIC for Raymond W. Bliss Army Health Center, Fort Huachuca Army Health Center, S4 SGM and BDE PM NCO at 1st Medical Brigade Fort Hood.

During his military career, he has deployed to Afghanistan twice in support of Special Operations Task Force - Afghanistan, and to Katy, Texas in support of Hurricane Harvey relief efforts.

First Sergeant Tally's military education include the Basic Airborne Course, Warrior Leaders Course (Commandants List), Advanced Leaders Course, Senior Leaders Course (Commandants list), Masters Leaders Course, Commander/First Sergeant Course, Senior Preventive Medicine Course, Battle Staff, AMEDD Junior Leadership Course, SHARP Certification Course, Master Resilience Training Course, Combative's Level 3 and the Pregnancy Postpartum Program Leader Course.

MENTOR BIOS

His awards include the Bronze Star [2 oak leaf clusters]; Meritorious Service Medal [2 oak leaf clusters]; Army Commendation Medal [3 oak leaf clusters]; Army Achievement Medal [7 OLC]; Army Good Conduct Medal [4th award]; Afghanistan Campaign Medal; National Defense Service Medal; Korean Defense Service Medal; Global War on Terrorism Medal; Armed Forces Service Medal; Humanitarian Service Medal; NCO Professional Development with numeral 4; Army Service Ribbon; Overseas Service Ribbon with numeral 3; NATO Medal; Valorous Unit Award; Meritorious Unit Commendation; Public Health Service Commendation Unit Award Ribbon; Parachutist Badge and Driver Mechanic Badge.



SGT Nissa JnoCharles
8th Grade Mentor,
Non-Commissioned Officer (NCO)

U.S. Army Medical Research and Development Command [MRDC]

SGT Nissa JnoCharles was born on the Island of Dominica. She enlisted into the Army Reserve in October 2009. She went to Basic Combat Training [BCT] at Fort Loenardwood, MO and Advanced Individual Training [AIT] at Fort Sam Houston, TX. Upon completing training she was awarded the Military Occupational Specialty [MOS] 68X- Behavioral Health Technician. SGT JnoCharles re-enlisted into the Active Army in June 2016 and was assigned to the 101st AASSLT, Fort Campbell, KY.

SGT JnoCharles' civilian education includes a B.S. in Psychology from the University of Colorado, Colorado Springs among several certifications in other areas of concentration.

SGT JnoCharles' military education includes: Traumatic Event Management Course, Equal opportunity Management Course, Army Retention Course, Basic Leader Course, Security +, Alcohol & Drug Rehabilitation Training and Combat Stress Control.

Throughout her career, SGT JnoCharles has served as a Research Technician with the Warrior Performance Group [WPG] at the U.S. Army Aeromedical Research Laboratory [USAARL], Training NCO, HQ, USAARL Behavioral Health NCO, WPG, USAARL, NCOIC, Family Advocacy Clinic, Medical Activity-Korea [MEDDAC-K], Republic of Korea [ROK], Behavioral Health NCO, Warrior Embedded Behavioral Health Clinic, ROK, NCOIC, Inpatient Behavioral Health, MEDDAC-K, ROK, Behavioral Health Tech, Inpatient Behavioral Health, MEDDAC-K, ROK, Behavioral Health Tech, 426 BSB, 1BDE, 101ST AASSLT, FT Campbell, KY, Behavioral Health Tech, 134th MED Det Army Reserve, FT Carson, CO, Physical Evaluation board Liaison Officer, Army Reserve, FT Carson, CO and a Behavioral Health Tech, 6252nd United States Army Hospital, San Diego, CA.

SFC Bucholtz has served five deployments in Pakistan, Iraq, and Afghanistan as an Aircraft Structural Repairer in support of humanitarian aid, Operation Iraqi Freedom, Operation Enduring Freedom and Operation Freedom's Sentinel. SFC Bucholtz has successfully completed the Army's Warriors Leaders Course, Basic Leadership Course, Senior Leadership Course, Battle Staff Course and Army

MENTOR BIOS



Mr. Apurva [AP] Shah
8th Grade Mentor,
Scientist & Engineer [S&E]

U.S. Army Combat Capabilities Development Command C5ISR Center [DEVCOM C5ISR]

Mr. Apurva [AP] Shah serves as an Electronics Engineer in the Cyber Technology Division in the Research Technology and Integration Directorate [RTI] of the C5ISR Center, Combat Capabilities Development Command [DEVCOM] at Aberdeen Proving Ground [APG], Maryland.

Mr. Shah began his Department of the Army career while in high school, as a participant in the Science and Engineering Apprenticeship Program [SEAP] at the Army Research Laboratory and in the Gains in the Education of Mathematics and Science [GEMS] Program.

Passionate about all-things information and cyber technology, Mr. Shah supports multiple programs in the Cyber domain, including a broad spectrum of capabilities and initiatives that provide tactical decision makers with the assurance, awareness and protection needed to operate effectively in the cyberspace environment and the ability to exploit, deny and disrupt the adversary's use of it.

Mr. Shah graduated with Honors from the University of Maryland, Baltimore County with a Bachelor of Science degree in Chemical Engineering and Johns Hopkins University with a Master of Science degree in Electrical and Computer Engineering. Mr. Shah also holds a Graduate Certificate in Systems Engineering from the Stevens Institute of Technology. He received an Official Commendation from the Department of the Army in 2011. In 2018, Mr. Shah was awarded the Department of the Army Commander's Award for Civilian Service.

Mr. Shah is an avid fan of Philadelphia sport teams and enjoys mentoring young STEM learners.



SFC Darius Raines
9th Grade Mentor,
Non-Commissioned Officer (NCO)

U.S. Army Combat Capabilities Development Command Army Research Laboratory [DEVCOM ARL]

SFC Darius Raines was born and raised in Atlanta, GA before enlisting in the U.S. Army in 2006. He has served many assignments, including a Recruiter for the North Bay Company in Fairfield, CA from 2014-2018; Platoon Sergeant from 2018-2019 and Master Gunner from 2019-2021 in Fort Bragg, NC; and at present is a Research Development Test & Evaluation NCO at the U.S. Army Combat Capabilities Development Command Army Research Laboratory [DEVCOM ARL] in Adelphi, MD. His awards and honors include the Bronze Star, Army Commendation Medal [3OLC], and Army Achievement Medal [4OLC]. SFC Raines has many goals. Professionally, he would like to complete his Bachelor's of Science in Engineering and PMP Certification. Personally, he hopes to complete a full marathon, open an auto detail shop, and continue to push himself to learn new things and obtain new skills. In his free time, SFC Raines enjoys sports cars, house plants, woodworking, videography, art, and his two-year-old dog, Titan.



Ms. Haley Fica
9th Grade Mentor, Scientist & Engineer [S&E]

U.S. Army Combat Capabilities Development Command Armaments Center [DEVCOM AC]

Ms. Haley Fica is a mechanical engineer at the U.S. Army Picatinny Arsenal where she works on large caliber weapons systems, focusing on test and evaluation of prototype systems. She graduated with her undergraduate degree in Physics from Barnard College and has a Master degree in Mechanical Engineering from Columbia University. She has taught physics to undergraduates for over 5 years and previously interned at places such as NASA Ames Research Center, the American Museum of Natural History, and Carnegie Observatories. Along with engineering, she supports local Girl Scout Troops and dances professionally in New York City.

ALUMNI BIOS



Solon Abel
eCYBERMISSION

Born and raised in Annapolis, Maryland, Solon Abel started his education at Chesapeake Montessori School from preschool to 14 years old. Later, he attended the STEM program at South River High School and is graduating in June 2022. During his time at South River, Solon participated in the eCYBERMISSION program and qualified as a Regional Finalist for his project on increasing the efficiency of Solar Panels through ceramic coatings. Along the way, he has participated in Boy Scouts of America and received Eagle Scout in October of 2021. In addition, he has worked a part time job at an Auto Shop all 4 years of high school and is currently interning as a technician at an Oyster Hatchery in Eastern Maryland. Solon has committed to Drexel University in Philadelphia and plans to start his Bachelors of International Business in Fall 2022.



Dr. Valerie Adams
eCYBERMISSION, JSHS, SMART

An alumnae of the AEOP Apprenticeship [CQL] program, Jahin graduated from Virginia Tech and is now a technology consultant working within Accenture's U.S. Federal practice. Contributing to real-world projects, interacting with some of the top professionals in the field, and coming out with valuable research results all culminated in an overwhelmingly rewarding experience through AEOP and her STEM journey. She is excited to serve as a resource to future AEOP participants looking to pursue a career in the exciting and forever growing STEM field!

STEM CAREER WORKSHOPS

Department of Defense Research Centers and Laboratories

U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND ARMAMENTS CENTER

Single Propeller Pivot Thruster

In guided munitions, diversion maneuvers are required to get a body "on track" to its destination. One common device that is used is a propeller. They can usually be found on lower speed items. In this workshop, students created a working divert thruster. They assembled a propeller with an electric motor, inline with a switch, and powered by two AA batteries. They then identified the stable balance point and attempted to get their assembly to spin around a stationary pivot.



U.S. ARMY PUBLIC HEALTH CENTER

Insect Olympiad: Are you better than a bug?

Insects are really good at what they do, but are humans better? Students found out in this APHC workshop. They learned about how insects develop, communicate, and create. Could they build it taller or stronger than an insect? Could they find their way around with insect vision? Successfully follow the scent trail to food? Jump higher or run faster? Plus, students participated in the premier attraction: maggot art!



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND C5ISR CENTER

Build a "Budd Light" Activity

This workshop was perfect for students that have ever wondered what it's like to be a U.S. Army engineer solving real-life problems in the field. Using specific design parameters, and a guided process, students designed a signaling device for Soldiers that can only be visible with Night Vision Goggles.



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND SOLDIER CENTER

Meal, Ready-to-Eat [MRE] Tech Demo

Students learned about the capabilities, requirements, and science that support MREs [Meals, Ready to Eat], the Military's most widely utilized individual operational ration. Students had their own MRE and were able to prepare and sample their own MRE along with workshop leads. Students were then encouraged to ask questions and provided feedback on their MRE.



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND GROUND VEHICLE SYSTEMS CENTER

PackBot Unmanned Ground Vehicle [UGV] Operation, Velocity Measurements, and Object Retrieval

The operation of an unmanned ground vehicle [UGV] was taught to students, including basic operation [driving, operating cameras/manipulator arm]. Students then drove the UGV at 3 different preset velocities using the UGV controller and performed velocity measurements. Students also used the UGV manipulator arm to pick up various objects on the ground near the robot and retrieve them. They learned the various components of the PackBot UGV, including the drive motors, arm motors, and batteries that allow for hours of operation. Additional payloads for the robot were discussed, including additional arm end effectors for picking up a variety of objects, including being able to open doors, as well as payloads to increase the view of the robot's cameras to give a higher perspective of the environment, and different types of cameras that can be installed, including thermal and infrared. Different robot power sources were discussed, including fuel cells for extended robot operational time.



STEM CAREER WORKSHOPS

Department of Defense Research Centers and Laboratories

U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND AVIATION AND MISSILE CENTER / NASA LANGLEY RESEARCH CENTER NATIONAL SECURITY AGENCY

How Strong is Your Chocolate?

Composite structures have been used for thousands of years to create superior materials that satisfy criteria not otherwise attainable with individual constituents. The fundamental concepts of composites are rather simple and easy to convey. In this lab, we used an unconventional composite—chocolate bars—to draw the attention of students and to mimic real engineering principles for the purposes of STEM education. For this lab, we have adapted American Ceramic Society's "How Strong is Your Chocolate?" Materials Science Classroom Kit to instruct students about composite materials in the discipline of materials science. In this hands-on lab activity, we used a rudimentary three-point bend test rig to measure the flexural strength for milk chocolate bars, chocolate bars consisting of cookie bits, and crisped rice as "reinforcement" material at two different temperatures. Parallels to materials testing in real-life were drawn based on the data collected while everyone enjoyed a sweet treat. This is arguably the most delicious lab experiment students will ever do!



NATIONAL SECURITY AGENCY: K-12 ACADEMIC OUTREACH

Cryptanalysis 101

Cryptanalysis 101 outlined basic cryptology terminology and techniques, plus examined the mathematics behind cryptanalysis (frequency counts and cipher patterns). Students decrypted several messages using substitution and transposition techniques.



U.S. ARMY CORPS OF ENGINEERS ENGINEER RESEARCH AND DEVELOPMENT CENTER

A River Runs Through It: Navigation, Flood Risk, and Environmental Protection



This workshop was a hands-on activity in which students learned about river management and flood risk using a water table. The U.S. Army Corps of Engineers' overall mission and operations was briefly discussed. Students were then encouraged to consider the aspects of a river system that typically need to be managed. They were then presented with a stretch of the Mississippi River located in St. Louis, Missouri that is represented on the water table. After observing how the river flow impacts areas of interest in and around the river, each student was assigned a particular role on the river management team. The team objectives were to prevent flooding in the nearby town, to keep the navigation channel passable for river traffic, to protect an endangered bird habitat, to ensure that the local port is dredged, and to reuse any dredged material effectively. The students developed a river management plan and moved sediment and added protection to vulnerable areas on the water table. The effectiveness of the plan was then tested when the water was turned on!

U.S. ARMY TEST AND EVALUATION COMMAND WHITE SANDS MISSILE RANGE

Circuits

This workshop was an introduction to electronic circuits and digital states. This interactive workshop gave an overview of the different types of electronic components, LEDs, ohm resistors, and more. The students were engaged in building and programming electronic components to control various sensors and digital LEDs.



STEM CAREER WORKSHOPS

Department of Defense Research Centers and Laboratories

U.S. ARMY TEST AND EVALUATION COMMAND YUMA PROVING GROUND

Water Balloon Ballistics & Trajectory

In this workshop, students learned about the ballistics and flight characteristics of objects launched from a system and understood the correlation between launching water balloons and firing shells from an artillery cannon. Then, they attempted to hit a target with a water balloon using a launcher. The goal was to understand how simple concepts [launching a water balloon] use the same basic principles as complicated systems [firing an artillery cannon]. The students then learned the importance of taking data [measurements], and using that to modify their system to try and accomplish the goal of hitting a target.



U.S. ARMY TEST AND EVALUATION COMMAND YUMA PROVING GROUND

Vehicle Acceptance Testing with RC Cars

Using Remote Control [RC] cars, students ran a series of tests to determine the performance abilities of their assigned vehicles. This lab enabled students to understand vehicle design as well as conduct an analysis of experiments through hands-on experience using mathematical concepts such as estimating and measuring distance, time, and speed and then related it back to the real world testing that is done for the U.S. Army.



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND DATA & ANALYSIS CENTER

Nuclear Plant Cyber Breach – Capture the Flag

A Capture-The-Flag is an information security competition where cyber professionals solve challenges to capture "flags". A flag is a piece of text or data that has been hidden. To uncover the flag, students solved challenges. The challenges had a wide range of categories, from decrypting secret messages to performing advanced Cross Site Scripting [XSS] injection. Students learned to use webpage browser tools to inspect HTML/JavaScript and utilize encryption/decryption algorithms to Capture the Flag. In this Capture-The-Flag event, students were exposed to common web vulnerabilities, server-side programming languages, and basic security concepts in a contained environment.



JUDGE BIOS

GRADE SIX AND SEVEN



Ms. Jennifer Cearfoss
Director of Technical Services
 Army Public Health Center (APHC)

As the Director of Technical Services for the Army Public Health Center (APHC), Aberdeen Proving Ground, Maryland, Ms. Cearfoss is responsible for overseeing the Center's scientific programs and more than 600 scientists, physicians, engineers, industrial hygienists, veterinarians, and other public health professionals with the primary mission of identifying and assessing current and emerging health threats; developing and communicating public health solutions; and assuring the quality and effectiveness of the Army's Public Health Enterprise.

Ms. Cearfoss is a proud alumna of the University of Virginia where she earned a Bachelor of Arts degree in Environmental Science and where she was also a Division I student athlete on the NCAA and ACC Championship Women's Rowing team. Ms. Cearfoss later earned a Master of Science degree in Environmental Engineering and Science from Virginia Tech, and a Master of Business Administration from the University of Baltimore/Towson University. She is a registered Professional Engineer in the Commonwealth of Virginia.

Ms. Cearfoss began her federal career as a project officer and environmental engineer at the U.S. Army Center for Health Promotion and Preventive Medicine, a predecessor organization of APHC, evaluating, designing, and executing projects involving complex technical issues within the water resources field. Ms. Cearfoss also served as the Dive Safety Officer and Divemaster for the APHC Scientific Diving Program throughout her tenure, responsible for ensuring the safety of all scientific diving operations during human health and environmental risk assessments at USAG-Kwajalein Atoll. Most recently, Ms. Cearfoss served as the APHC Executive Officer, where among her duties she led the Center's talent management efforts to include the development of APHC's first formal mentorship program and was a founding member of the APHC Diversity, Equity, Inclusion, and Accessibility (DEIA) Council focused on facilitating a more diverse and empowered workplace and encouraging the investigation of DEIA impacts on the public health and readiness of the Army."



Mr. Christopher Deleon
Engineering and Technology Teacher
 Team Advisor of the Year

Christopher Deleon has taught Engineering and Technology Education at Hudson Middle School in Hudson, Wisconsin for the past 22 years. He has been instrumental in building an award winning engineering program at Hudson Middle School. Christopher has mentored student eCYBERMISSION teams for the past 7 years where his students have earned state, national and international recognition and honors. Christopher says that what he really enjoys about advising eCYBERMISSION teams is that eCYBERMISSION gives students the confidence in their own abilities to solve real world problems by applying the skills that they are learning in the classroom. Christopher is quoted as saying "My students are learning at an early age that they have the ability to change the world for the better".



COL Corey James
Professor and Deputy Department Head
 United States Military Academy West Point (USMA)

COL Corey James is a Professor and Deputy Department Head at the United States Military Academy West Point (USMA). COL James graduated from USMA in 1999 and served as an aviation officer for fifteen years before being selected to receive his PhD in chemical engineering (University of Texas, 2017) and serve as permanent faculty at West Point. He teaches all of the chemical engineering undergraduate courses and also conducts research in the area of the control and optimization of energy and water systems. Prior to receiving his PhD, he served in a variety of operational positions to include Platoon Leader, Company Commander, Battalion Operations Officer, and Battalion Executive Officer. Corey is a graduate of the AH-64D maintenance test pilot course, airborne course, and his awards include the combat action badge, bronze star medal, air medal, meritorious service medal, and Army commendation medal. His operational experience includes serving in Europe, Iraq, and Afghanistan and accumulating

JUDGE BIOS

GRADE SIX AND SEVEN

over 2,000 hours of flight time. COL James enjoys flying and fishing in his free time and lives with his wife Jo and two sons, Caleb and Colton, in Cornwall, NY.



Dr. Zulema Caldwell
Technical Director
 National Security Agency (NSA)

Zulema Caldwell graduated with a BS in Electrical Engineering from Texas A&M University and an MS in Electrical Engineering from the University of Maryland at College Park. She completed her PhD in Information Technology with a specialization in Computer Information Security at Capella University. Zulema has a wealth of experience as a researcher, engineer, and software developer. She is currently a technical director specializing in cyber security solutions for critical infrastructure, industrial control systems, and industrial Internet of Things (IIoT) devices. Zulema has performed research for several projects focused on energy disaggregation, security event management, as well as speech processing. She is a certified computer information security specialist (CISSP), and she has served as an instructor at several higher learning institutions. She is currently an adjunct faculty at University of Maryland Global Campus in the Cybersecurity Management Department. Zulema is also a founding member of the University of Maryland Clark School Women in Engineering Advisory Board, and she devotes a significant amount of time supporting STEM programs at local elementary and middle schools and serving as a mentor for high school and college students.



Mr. Michael Skurla
Deputy Assistant Director, Rapid Reaction & Response
 U.S. Army Combat Capabilities Development Command C5ISR Center (DEVCOM C5ISR)

Mr. Michael Skurla currently serves as the Deputy Assistant Director of the U.S. Army Combat Capabilities Development Command (DEVCOM), Command, Control, Communications, Computer, and Cyber, Intelligence, Surveillance, and

Reconnaissance (C5ISR) Center, Engineering and Systems Integration (ESI), Readiness Engineering (RE), Rapid Reaction & Response (RR&R) portfolio. The RR&R Portfolio is comprised of 3 Divisions: Avionics Force Protection Software Support; Exploitation Analysis & Response; and SIGINT & Quick Reaction Capability. Efforts include providing software acquisition and sustainment support, analysis of commercial based technology and the development of quick reaction capabilities.

Mr. Skurla served as the C5ISR Center Software Engineering Directorate (SED) Aug 2008 – Sep 2021. In this capacity, he supported the C5ISR Center's efforts to conceptualize, develop, provide and improve software products, services and technologies to enhance the warfighting capabilities of the Army, Joint Services and Coalition Forces, along with supporting Homeland Defense initiatives. These products and services include: system level software engineering for over 200 individual battlespace systems; system-of-systems level software integration; software architecture design and implementation; software technology assessment and application; software quality assessment, and world-wide technical support to deployed systems. Mr. Skurla previously served as SED Deputy Director from July 2004-2008.

Mr. Skurla also served as the Executive Secretariat for the DOD Joint Advisory Council and Joint Advisory Council Executive Group that oversee the Software Engineering Institute, a Federally Funded Research and Development Center that conducts software engineering research in acquisition, architecture and product lines, process improvement and performance measurement, security engineering, and system interoperability and dependability.

Prior to this assignment, he served as the Chief of Homeland Operations for the U.S. Army Combatant Command Interoperability Program Office. He worked closely with the Department of Homeland Security, FEMA Region II, State of New Jersey, and the Port Authority of New York and New Jersey fostering improvements in interoperability and situational awareness.

Mr. Skurla holds a Bachelor of Science in electrical engineering from Wilkes College, PA, as well as a Master of Science in software engineering from Monmouth University, NJ. Mr. Skurla completed the Software Engineering Program of the U.S. Army Logistics Management College, Texarkana, TX.

JUDGE BIOS

GRADE EIGHT AND NINE



Ms. Cynthia Bedell
Director, Computational & Information Sciences Directorate
 U.S. Army Combat Capabilities Development Command Army Research Laboratory [DEVCOM ARL]

As the Director for the U.S. Army Combat Capabilities Development Command [DEVCOM] Army Research Lab [ARL] Computational & Information Sciences Directorate, Cynthia Bedell is responsible for basic and applied research into Network and Information Sciences, Cyber Defense, and Battlefield Environments. She has technical oversight of the state-of-the-art high performance computing assets, to include artificial intelligence computational capabilities, and wide area networking methodologies for ARL, DA, and DoD. ARL is the U.S. Department of the Army's foundational research laboratory, strategically placed within the Army Futures Command [AFC].

Previously, as the Regional Lead for ARL West, Cindy Bedell established the first remote research campus for the U.S. Army Research Lab, in Los Angeles, thus making ARL and its researchers more accessible to academics as well as business research leaders on the West Coast. ARL West's strategically focused partnership goals are to accelerate understanding and capabilities in the field of Human Information Interaction. When she joined CISD in 2014, Ms. Bedell served as the Associate Directorate for Science and Technology as well as the collaborative alliance manager for the Multi-scale Materials Enterprise.

Cindy Bedell brings with her 30 years of military experience. Prior to her military retirement, Colonel Bedell led the U.S. Army Research Development and Engineering Command [RDECOM] Forward Element Command - Atlantic searching across Europe, Africa, and the Middle East, for applicable research and emerging technologies to support current and future warfighters. She also served as the Director of Science and Technology Support for Current Operations for the System of Systems Integration Office, RDECOM. She helped develop science and technology strategies to allow the Army to address technology shortfalls in current and future war-fighting systems.

In PEO Soldier, as Product Manager, Sensors and Lasers, Colonel Bedell was responsible for the Soldier-borne night vision devices, thermal sensors and sights, as well as laser pointers, rangefinders and designators. She accelerated

the engineering design cycles for a number of systems; to include the Enhanced Night Vision Goggle and the 25 micron Vanadium Oxide based Thermal Weapons Sight.

She earned both a Bachelor's and a Master's degree from the Massachusetts Institute of Technology. She served as Assistant Professor in the Civil and Mechanical Engineering Department at the United States Military Academy. In 2004-2005, she attended the University of Texas, as a Senior Service College Fellow. She holds United States Patent 5,413,649, with Dr. David Dunand for a method to enhance superplasticity for ease in forming complex composites in materials that undergo phase transformation.



LTC Victor Jaffett, Ph.D
Course Director, Organic Chemistry I and II
 United States Military Academy West Point [USMA]

Lieutenant Colonel Victor Jaffett is an Academy Professor in the Department of Chemistry and Life Science at the United States Military Academy West Point. He earned a BS in systems engineering from the United States Military Academy in 2002 and commissioned as a signal officer. He has served in tactical signal and Stryker infantry units with operational deployments to Iraq. He received both his MS and PhD in Chemistry from the University of Wisconsin at Madison in 2011 and 2019, respectively.

LTC Jaffett is currently the Course Director for Organic Chemistry I and II. Previously, he has taught General Chemistry I and II. LTC Jaffett's research focuses on the synthesis of novel iridium[III] cyclometalated complexes for exploration of non-linear optical properties.

JUDGE BIOS

GRADE EIGHT AND NINE



Dr. William Truran
Project Officer
 U.S. Army Combat Capabilities Development Command Armaments Center [DEVCOM AC]

William R. Truran, PhD PE, has been a PMP and is working as a project officer with the U.S. Army Combat Capabilities Development Command Armaments Center. He has over forty years of experience in engineering as an engineer, manager, owner and entrepreneur of a controls technology firm, a decade as an industry professor, and author with five published books. He is currently involved with the application x-ray science and learning systems and managing the insertion of this technology. He has a BS in Electrical Engineering, MBA, MS in Industrial Engineering and Operations Research, and a PhD in Engineering.



Dr. Chi-Chin Wu
Materials Engineer
 U.S. Army Combat Capabilities Development Command Army Research Laboratory [DEVCOM ARL]

Dr. Chi-Chin Wu is a Materials Engineer at the Weapon Sciences Division of the Weapons and Materials Research Directorate, U.S. Army Combat Capabilities Development Command Army Research Laboratory [DEVCOM ARL]. At DEVCOM ARL, Dr. Wu leads research programs to develop scalable plasma technologies novel materials for producing novel materials of interest to the U.S. Army. Dr. Wu has dual PhD degrees in Material Science and Engineering from University of Virginia and in Chemical Engineering from Kansas State University. Dr. Wu's career is decorated with diverse experiences in both industry, academia, and research prior to joining ARL in 2010. Her U.S. careers before ARL include being an assistant professor at the Physics and Astronomy and the Chemistry Departments at Virginia Military Institute [VMI], materials scientist, teaching assistant and advanced microscopy trainer at the University of Virginia. Dr. Wu is active in the Materials Research Society [MRS]. She has chaired/organized 4 technical symposia at MRS Fall Meetings. She organized and served as a panelist for MRS's inaugural Diversity, Equity, and Inclusive [DEI] event at the 2021 MRS Fall Meeting. She

currently serves on the Career Advancement Committee leading the "Researcher of Color" Focus Interest Group. In addition to MRS, Dr. Wu is also a life-time member of the American Institute of Chemical Engineers [AIChE], and a member of American Physical Society [APS], American Chemical Society [ACS] and Women in Defense. Dr. Wu recently received the Department of the Army Civilian Service Achievement Medal and the 2022 Northeastern Maryland Technology Council Mentor Award. Outside of her profession, Dr. Wu is known in the local community as an avid long-distance runner. To date, Dr. Wu has finished sixteen full marathons, two 40 miler and twenty-three 50k ultra trail races since her first marathon in 2008.



Dr. Elizabeth Mulkerrin
President-elect
 National Science Teaching Association [NSTA]

A desire for lifelong science learning and a passion for the natural world brought high school science educator Elizabeth Mulkerrin to the Omaha Zoo and Aquarium, where she has served as Vice President of Education since 2000.

In this position, Mulkerrin creates and designs zoo exhibits and associated educational materials, works to provide positive visitor experiences, partners with local leaders to engage the community, develops unique partnerships to drive the zoo's mission, raises funds through donors and corporate relations, and has crafted a five-year strategic plan for the zoo. Last year during the pandemic, she created and implemented innovative events and programs that generated revenue during the zoo's closure from March to August 2020.

She leads the team that provides quality STEM education programming to 158,000 students annually, and is co-founder of the Omaha STEM Ecosystem, a grassroots organization that brings business and education together in developing Omaha's STEM workforce.

Mulkerrin is also the driving force behind the zoo's collaborative partnerships and innovative informal education programming with local Omaha school districts and universities. These partnerships created several academies that provide students with knowledge and career

JUDGE BIOS

GRADE EIGHT AND NINE

explorations relating to life sciences through authentic STEM (science, technology, engineering, and math) experiences at the zoo.

In addition to serving on the NSTA Executive Board as President-Elect, Mulkerrin also served on the executive board and as president of the National Science Education Leadership Association (NSELA). She was a division director for informal science for both the NSTA and NSELA Board of Directors. She also completed the Association of Zoos and Aquariums (AZA) Executive Leadership Development Certificate Program in 2019.

Mulkerrin is active with a number of national science and informal education associations, including the AZA, the National Science Olympiad, and the Association of Science and Technology Centers (ASTC).

In Nebraska, Mulkerrin works with districts on curriculum development and strategic planning. She has served in leadership roles for the Nebraska Junior Academy of Science; the Nebraska State Science Olympiad Board; the Nebraska Next Generation Science Standards Review Committee; the Nebraska Association of Science Teachers; the Department of Education Math Science Partnership Board; and the Nebraska Building a Presence for Science/ Science Matters Advisory Board.

She has received numerous honors from both formal and informal education groups, including the AZA Innovative New Exhibit Award; the NSTA Distinguished Informal Science Educator Award; the University of Nebraska Distinguishing Alumni Promising Professional Award; the Nebraska Academy of Science Friends of Science Award; the Nebraska Association of Teachers of Science Business Partner "Catalyst" Award; the Phi Delta Kappan "Outstanding Service to Education" Award; and the Nebraska Career Education "Outstanding Business/Industry Partnership" Award.

Currently, as an adjunct professor at the University of Nebraska Omaha, she teaches a graduate course in science education and an administrative leadership course. Mulkerrin has also published works on a myriad of topics including STEM careers, job shadowing, professional learning, and collaborative initiatives between informal and formal education. She received her Master's and PhD degrees from the University of Nebraska Omaha, and her undergraduate degree from the University of Nebraska at Lincoln. Before joining the Omaha Zoo and Aquarium, she taught high school biology and zoology for six years in Omaha Public Schools.

VOLUNTEERS

OF THE YEAR

Each year, eCYBERMISSION awards students for their efforts in solving community problems and expanding their knowledge by applying Science, Technology, Engineering, and Mathematics (STEM) to real-life situations. eCYBERMISSION would also like to recognize its volunteers for their hard work and dedication in promoting the competition, mentoring student teams, and judging Mission Folders. Volunteers play a vital role in the competition and are a huge contributor to the success of eCYBERMISSION. This year, we want to congratulate the following individuals for their outstanding support of the program in their respective volunteer roles.

CYBERGUIDE OF THE YEAR



Dr. Alexander Tobias

Research Chemical Engineer

U.S. Army Combat Capabilities Development Command Army Research Laboratory (DEVCOM ARL)

Dr. Alexander Tobias has been involved with eCYBERMISSION since 2016. During the 2021-2022 competition year, Dr. Tobias devoted 55 hours of volunteer time to eCYBERMISSION, including 4 CyberGuide Live Chats and mentoring 2 students through the Chronus platform. During the 2020-2021 competition year, Dr. Tobias participated in 2 CyberGuide Live Chats and mentored 4 students. Also serving as a Virtual Judge, Dr. Tobias' comments are incredibly detailed and helpful, and his attention to detail and commitment to providing positive, constructive feedback is commendable. Dr. Tobias' dedication, reliability, and consistent involvement have made him an essential member of the eCYBERMISSION volunteer team.

VIRTUAL JUDGE OF THE YEAR



HM2 (SW/AW) Christopher Moran

Petty Officer 2nd Class
United States Navy

HM2 Christopher Moran's dedication and volunteer service distinguishes him as an ideal volunteer. He consistently goes above and beyond to provide scores and comments to students, encouraging them to continue pursuing STEM. During the 2021-2022 competition year, HM2 Moran devoted 150 hours judging Mission Folders, over double the 70 hours he volunteered judging Mission Folders during the 2020-2021 competition year. HM2 Moran's comments to students are thoughtful and encouraging, and his contribution and support to the eCYBERMISSION program is commendable.

VOLUNTEERS OF THE YEAR

AWARDS CEREMONY PARTICIPANTS

AMBASSADOR OF THE YEAR



Dr. Rebecca Zolotor

Associate Dean

Purdue University Global School
of Health Sciences

Dr. Rebecca Zolotor has been a Virtual Judge since 2018 and joined the eCYBERMISSION Ambassador team in Fall 2021. While serving as a Virtual Judge, Dr. Zolotor recruited 70 Virtual Judges to participate in eCYBERMISSION. After becoming an Ambassador in Fall 2021, Dr. Zolotor recruited another 83 new Virtual Judges. Due to her efforts, a total of 5 faculty, 54 students, and Dr. Zolotor collectively judged 381 Mission Folders during virtual judging during the 2021-2022 competition year. Dr. Zolotor is to be commended for fantastic outreach efforts and continued support for eCYBERMISSION.

TEAM ADVISOR OF THE YEAR



Mr. Christopher Deleon

Engineering and Technology Teacher

Hudson Middle School

Christopher Deleon has taught Engineering and Technology Education at Hudson Middle School in Hudson, Wisconsin for the past 22 years. He has been instrumental in building an award winning engineering program at Hudson Middle School. Christopher has mentored student eCYBERMISSION teams for the past 7 years where his students have earned state, national and international recognition and honors. Christopher says that what he really enjoys about advising eCYBERMISSION teams is that eCYBERMISSION gives students the confidence in their own abilities to solve real world problems by applying the skills that they are learning in the classroom. Christopher is quoted as saying "My students are learning at an early age that they have the ability to change the world for the better".

VIRTUAL JUDGING TOP 10 COLLEGES & UNIVERSITIES

eCYBERMISSION is proud to recognize the valuable contributions from our College and University Virtual Judges. Below are the Top 10 Colleges and Universities whose Virtual Judge volunteers judged the most Mission Folders this year.

1. Maryville University, St. Louis, MO
134 Virtual Judges, 708 Mission Folders
2. The United States Military Academy West Point,
West Point, NY
122 Virtual Judges, 592 Mission Folders
3. Purdue University Global, West Lafayette, IN
54 Virtual Judges, 381 Mission Folders
4. Massachusetts Maritime Academy, Buzzards Bay, MA
7 Virtual Judges, 63 Mission Folders
5. Howard University, Washington, D.C.
4 Virtual Judges, 37 Mission Folders
6. University of Idaho ROTC, Moscow, ID
8 Virtual Judges, 27 Mission Folders
7. University of Central Missouri, Warrensburg, MO
1 Virtual Judge, 27 Mission Folders
8. College of William & Mary, Williamsburg, VA
3 Virtual Judges, 22 Mission Folders
9. Northeastern University, Boston, MA
2 Virtual Judges, 22 Mission Folders
10. American Military University, Charles Town, WV
2 Virtual Judges, 21 Mission Folders



Jeffrey D. Singleton

Official Host

Director for Technology

Office of the Assistant Secretary of
the Army (Acquisition, Logistics &
Technology)

Jeff Singleton is a member of the Senior Executive Service and currently serves as the acting Deputy Assistant Secretary of the Army for Research and Technology / Army Chief Scientist, overseeing the basic, applied, and advanced technology development research investments for all Army laboratories, research, development and engineering centers — comprising programs at the Army Futures Command, the Army Research Institute, the Army Corps of Engineers and the Space and Missile Defense Technical Center with a combined annual budget of approximately \$3.1 billion. Mr. Singleton also serves as the U.S. National Principal Member on the NATO Science and Technology Board.

He began his career as a research engineer with the Department of the Army, first in the field of experimental rotorcraft testing and analysis then later as Team Leader and Division Chief for rotorcraft dynamics, structural mechanics, and aeromechanics. His extensive background in science and technology investigation spans more than two decades of fundamental research, advanced technology development and acquisition.

From July 1984 to May 2006, Mr. Singleton was employed by the Army Aviation Systems Command and the Army Research Laboratory Vehicle Technology Directorate located at NASA Langley Research Center in Hampton, Virginia. During this time, Mr. Singleton was primarily responsible for experimental and analytical research exploring new technologies and designs for advanced rotor performance, reducing rotor vibrations, and measurement and prediction of rotor aeromechanical stability for both conventional helicopters as well as tiltrotor configurations. From May 2006 to January 2011, Mr. Singleton held several positions within the Office of the Deputy Assistant Secretary of the Army, Research and Technology when he was selected as the Director for Basic Research. In May 2010 to January 2011, he served as acting Director for Research and Laboratory Management for the Army directing laboratory management policy for all Army laboratories, research, development and engineering centers – including the Army's Basic and Applied Research programs spanning 12 basic research disciplines and 14 technology areas at the Army Research

Laboratory, Army Research Institute, and the Army Corps of Engineers. From January 2015 to May 2015 served as the acting Executive Director for Technology for the Army, establishing policy and providing executive level oversight for the Army's Applied Research and Advanced Technology Development programs executed across five major Army commands with a combined annual budget of more than \$1.7B.

Mr. Singleton earned his Bachelor of Science degree in Aerospace Engineering from West Virginia University where he graduated magna cum laude in 1984. He also earned a Master of Science in Aerospace Engineering from the Georgia Institute of Technology in 1988, specializing in rotorcraft aeroelasticity.

Mr. Singleton is a recipient of the Department of the Army Superior Civilian Service Award, the Army Research Laboratory Honorary Award for Leadership and the American Helicopter Society International Howard Hughes Award as team leader for the Army/NASA/Bell Quad Tiltrotor Aeroelastic Test Team given in recognition of an outstanding improvement in fundamental helicopter technology. Mr. Singleton has authored more than 80 invited presentations, scientific conference publications and refereed journal articles.

Mr. Singleton is married to Paula Singleton and has two sons, Nathan and Hayden. He is a native of Charleston, WV.

AWARDS CEREMONY PARTICIPANTS



Maj. Gen. Edmond 'Miles' Brown

**Awards Presentation
Commanding General**

U.S. Army Combat Capabilities Development Command [DEVCOM]

Maj. Gen. Miles Brown assumed command of the U.S. Army Combat Capabilities Development Command (DEVCOM) on July 9, 2021. As DEVCOM's Commanding General, Brown leads a world-class team of science and technology experts fully focused on empowering the future American Soldier with advanced Army capabilities made possible by cutting-edge technology forecasting, research and development.

Brown is a native of Honea Path, South Carolina and was commissioned as a Field Artillery Officer from The Citadel.

He has served in Korea, Kuwait, Iraq, and Afghanistan with stateside duty at Fort Stewart [Georgia]; Fort Hood [Texas]; Fort Riley [Kansas]; Fort Carson [Colorado]; Fort Eustis [Virginia]; and Washington, DC. His staff and joint assignments include Aide-de-Camp to the Commander, Multi-National Force-Iraq; Chief of Staff, 4th Infantry Division; Deputy Commanding General Support, 1st Cavalry Division; and Deputy Director/Chief of Staff, Futures and Concepts Center, U.S. Army Futures Command.

Brown's commands include an Artillery Battalion in Iraq, a Brigade Combat Team in Kuwait, and the Train, Advise, Assist Command-South (TAAC-S) in Afghanistan. He has served eight tours in South Asia during Operations Desert Fox, Intrinsic Action, Desert Spring, Iraqi Freedom, New Dawn, Spartan Shield, Eager Lion and Resolute Support.

He is a graduate of the Field Artillery Officer Basic Course, the Armor Captains Career Course, the U.S. Army Command and General Staff College, and the National War College. His civilian education includes degrees in history, administration and national security strategy from Central Michigan University and National Defense University. His awards and decorations include the Defense Superior Service Medal [with Oak Leaf Cluster], the Bronze Star Medal [with 2 Oak Leaf Clusters], the Iraqi and Afghanistan Campaign Medals, the Combat Action Badge and the Presidential Service Badge.

Brown is married with two children.



CH (LTC) Matthew Sprecher

**Invocation
Command Chaplain**

U.S. Army Combat Capabilities Development Command [DEVCOM]
Aberdeen Proving Grounds, Maryland

Chaplain Matthew Sprecher was born in Hagerstown, Maryland. He currently serves as the Command Chaplain for Combat Capabilities Development Command, U.S. Army Futures Command.

Chaplain Sprecher was commissioned a 1st Lieutenant on April 18, 2005. His first assignment was with the 2nd Brigade Combat Team, 101st Airborne Division (Air Assault) Ft Campbell, KY. He deployed to Iraq with the 2-101st BSTB on September 28, 2005. In February 2007 CH Sprecher was transferred to 1-502 Infantry Battalion, 2nd Brigade Combat Team, 101st Airborne Division. He deployed with the Unit to Iraq October 12, 2007. He was deployed for thirteen months and returned to Fort Campbell in November 2008. Other assignments include 1/16th and 2/16th CAV Squadrons, 316th CAV Brigade at Ft Knox, KY; Allied Forces North Battalion, US Army NATO Brigade at Joint Forces Command Brunssum, NL; 3-321 FA, 82nd Airborne Division; 525 MI Brigade, 18th Airborne Corps; and the U.S. Army Garrison Family Life Chaplain at Fort Gordon, GA

His awards and decorations include the Bronze Star Medal [1 OLC], Meritorious Service Medal [2 OLC], Army Commendation Medal [2 OLC], Army Achievement Medal, Valorous Unit Award, Meritorious Unit Citation, National Defense Service Medal, Iraq Campaign Medal, Global War on Terrorism Service Medal, Army Service Ribbon, the Combat Action Badge, and the Belgian Military Fitness Badge. CH Sprecher's civilian education includes a Bachelor of Arts in Youth Ministries, Master of Arts in Pastoral Theology, a Master of Ministries, and a Master of Arts in Counseling. He is licensed in the state of North Carolina as a Marriage and Family Therapist.

CH Sprecher is married with four children.

AWARDS CEREMONY PARTICIPANTS



Dr. Elizabeth Mulkerrin

President-elect

National Science Teaching Association [NSTA]

A desire for lifelong science learning and a passion for the natural world brought high school science educator Elizabeth Mulkerrin to the Omaha Zoo and Aquarium, where she has served as Vice President of Education since 2000.

In this position, Mulkerrin creates and designs zoo exhibits and associated educational materials, works to provide positive visitor experiences, partners with local leaders to engage the community, develops unique partnerships to drive the zoo's mission, raises funds through donors and corporate relations, and has crafted a five-year strategic plan for the zoo. Last year during the pandemic, she created and implemented innovative events and programs that generated revenue during the zoo's closure from March to August 2020.

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Mulkerrin is also the driving force behind the zoo's collaborative partnerships and innovative informal education programming with local Omaha school districts and universities. These partnerships created several academies that provide students with knowledge and career explorations relating to life sciences through authentic STEM [science, technology, engineering, and math] experiences at the zoo.

In addition to serving on the NSTA Executive Board as President-Elect, Mulkerrin also served on the executive board and as president of the National Science Education Leadership Association [NSELA]. She was a division director for informal science for both the NSTA and NSELA Board of Directors. She also completed the Association of Zoos and Aquariums [AZA] Executive Leadership Development Certificate Program in 2019.

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AWARDS CEREMONY PARTICIPANTS

2022 NATIONAL WINNERS



Dr. Erika Shugart
Awards Presentation Executive Director
 National Science Teaching Association [NSTA]

As the Executive Director of the National Science Teaching Association [NSTA], Dr. Shugart heads the world's largest professional organization representing science educators of all grade levels. Prior to joining NSTA, Shugart held various positions in science-related fields including Chief Executive Officer and Executive Director of the American Society for Cell Biology [ASCB]; Director of Communications and Marketing Strategy at the American Society for Microbiology; and Deputy Director of the Marian Koshland Science Museum of the U.S. National Academy of Sciences. Shugart has been recognized as a leader in the fields of informal science education and science communication. In 2010, she was elected as an AAAS Fellow for distinguished contributions and leadership in public understanding and engagement in science and was a Noyce Leadership Fellow from 2012-2013. Shugart holds a PhD in biology from the University of Virginia and a bachelor's degree in biology from the College of William and Mary.



Kevin Kaspar, Zoe Sherman, and Nandita Balaji

Keynote Speakers, CEO, CTO, and COO
 InfernoGuard

Kevin, Zoe, and Nandita are co-founders of InfernoGuard, a startup that provides prompt wildfire detection and notification to landowners through their flagship hardware product. InfernoGuard has won over \$270,000 in non-dilutive funding to propel their mission, including partnering with Yosemite National Park for a hardware deployment this summer. Kevin [CEO] attends Northwestern University, Nandita [COO] attends Johns Hopkins University, and Zoe [CTO] is a student at Lehigh University. They started working on InfernoGuard after experiencing the harmful smoke impacts from wildfires near their hometown of Charlotte, North Carolina, kicking off their work on eCYBERMISSION and placing as National Finalists in 2017 (and 2015 National Finalists, too!).



Matthew Hartman
Emcee
AEOP Learning and Development Manager
 eCYBERMISSION

Matthew Hartman, AEOP Learning and Development Manager, has been working in education for over 20 years. Matt has been a teacher, course developer, school board member, and science center presenter. He has spent the past ten years at NSTA working on the eCYBERMISSION program developing content and presenting workshops and sessions at NSTA conferences. Matt started with NSTA in 2011 working on the SciPacks and SciGuides in the Learning Center and also works as a professional performer and voice over artist.

6TH GRADE TEAM



OH, DEER!

SCHOOL: St. Richard Catholic School, Jackson, Mississippi
TEAM MEMBERS: Benjamin Manhein, Neel Boteler, Maley Thornhill, Lily Frances Garner.
TEAM ADVISOR: Ashley Klein

7TH GRADE TEAM



PLASTIC PATROL

SCHOOL: Southcrest Christian School, Lubbock, Texas
TEAM MEMBERS: Jett Hurst, Annerson Dooley
TEAM ADVISOR: Laura Stary

8TH GRADE TEAM



OMg

SCHOOL: Francis Granger Middle School, Aurora, Illinois
TEAM MEMBERS: Nidhi Sagaram, Samil Sharma, Viraj Vyas
TEAM ADVISOR: Aruna Rao

9TH GRADE TEAM



BUSY BEE TECH

SCHOOL: High Tech High School, Secaucus, New Jersey
TEAM MEMBERS: Ambika Rao, Romayssae Saidi
TEAM ADVISOR: Shelly Witham

ARMY EDUCATIONAL OUTREACH PROGRAM

The U.S. Army Educational Outreach Program (AEOP) is comprised of Army-sponsored research, education, competitions, internships, and practical experiences designed to engage and guide students and teachers in STEM education. In addition to eCYBERMISSION, AEOP offers the following opportunities:



STEM ENRICHMENT ACTIVITIES

• GEMS

FOR GRADES 5 6 7 8 9 10 11 12

A weeklong summer program at participating Army Research Laboratories that introduces students to key STEM principles.

PROGRAM LOCATIONS

AL, AZ, CA, FL, IL, MA, MD, MS, NM, NH, TX

• Unite

FOR GRADES 9 10 11 12

A four-to-six-week precollegiate summer experience for high school students interested in STEM. Unite is held at higher education institutions across the country.

PROGRAM LOCATIONS

Visit the website for current sites.

APPRENTICESHIPS & FELLOWSHIPS

• High School Apprenticeship

FOR GRADES 9 10 11 12

High school apprentices spend the summer in a university research lab or one of the U.S. Army Research Laboratories and Centers conducting research under the direct guidance of a mentor.

PROGRAM LOCATIONS

Visit the website for current sites.

COMPETITIONS

• Junior Solar Sprint (JSS)

FOR GRADES 5 6 7 8

Students design, build and race solar powered cars using engineering skills and principles of science and math in this STEM competition.

PROGRAM LOCATIONS

AL, AK, CO, CT, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MD, MO, MS, MT, NC, ND, NH, NJ, NM, OH, OK, OR, PA, RI, SC, TN, TX, UT, VA, WA, WV

• Junior Science and Humanities Symposium (JSHS):

FOR GRADES 9 10 11 12

High school students present their STEM research in local, regional and national competitions for a chance to earn scholarships and recognition.

PROGRAM LOCATIONS

Visit the website for current sites.

SCHOLARSHIPS & GRANTS

• Travel Awards

FOR GRADES 6 7 8 9 10 11 12 U 6

Travel awards cover the costs of scientific meetings and technical symposia for AEOP program participants and alumni interested in presenting their research.

For additional information about AEOP, applications, and deadlines, please visit www.usaeop.com.

ARMY VALUES

LOYALTY

BEAR TRUE FAITH AND ALLEGIANCE TO THE U.S. CONSTITUTION, THE ARMY, YOUR UNIT AND OTHER SOLDIERS.

DUTY

FULLFILL YOUR OBLIGATIONS

RESPECT

TREAT PEOPLE AS THEY SHOULD BE TREATED.

HONOR

LIVE UP TO ARMY VALUES.

SELFLESS

SERVICES

PUT THE WELFARE OF THE NATION, THE ARMY AND YOUR SUBORDINATES BEFORE YOUR OWN.

INTEGRITY

DO WHAT'S RIGHT, LEGALLY AND MORALLY.

PERSONAL COURAGE

FACE FEAR, DANGER OR ADVERSITY (PHYSICAL OR MORAL)



20 YEARS

eCybermission
ACCEPT THE CHALLENGE



#ecyber22



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@GOeCYBER



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eCYBERMISSIONTeam



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