

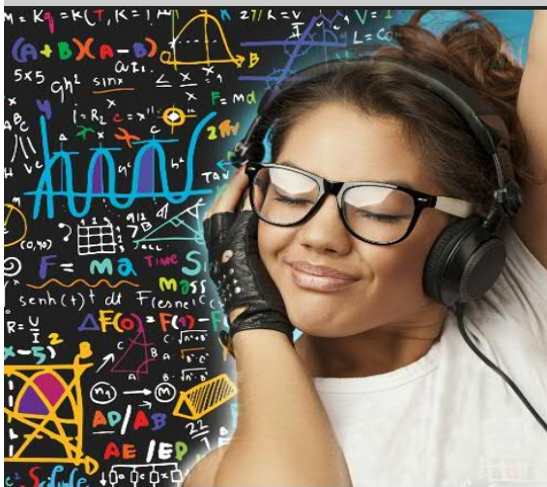


C5ISR CENTER STEM@Home

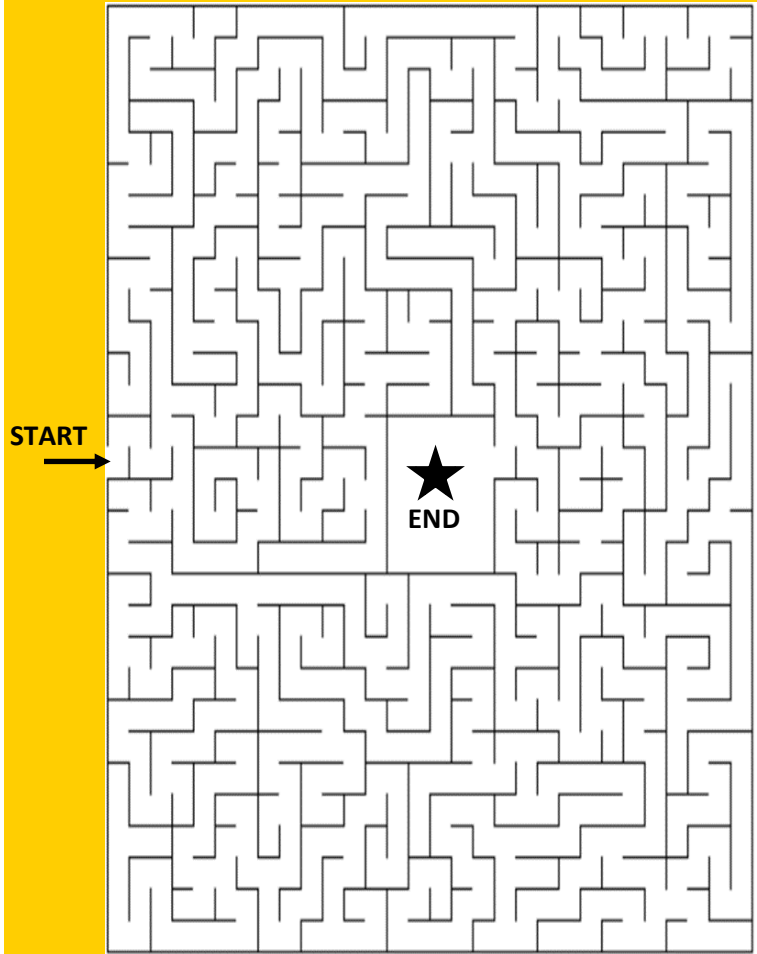
Welcome to STEM@Home!

As we maneuver the challenges of the COVID-19 epidemic, we strive to continue to make STEM accessible to all.

The STEM@Home Newsletter is intended to be a resource to provide engaging and educational activities that can be done with minimal materials and a whole lot of imagination.



Escape the Maze



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Issue 15



SHARE YOUR STEM...

Visit the C5ISR Center on Facebook to post a photo or video of your child completing one of the STEM@Home Activities.



<https://www.facebook.com/CCDC.C5ISR/>

#C5ISRCenterSTEM

Introducing Mr. David Arty



Name:

David Arty

Job Title:

Chief, Certification and Accreditation Branch

Length of Time as a U.S. Army Engineer:

16 Years

Education:

BA Computer Science and Chemistry— Cornell University—NY

MS Software Engineering from Monmouth —NJ

How does your job support the U.S. Soldier? The role of my branch is to provide cybersecurity support to Army systems and make sure the software that Soldiers use in the field is as secure as possible, meets mission requirements and is not open to any attacks that could prevent it from working reliably.

What is a typical day like for you? In a typical day, I support our systems' cybersecurity posture in a wide range of ways. I meet with system owners to help them understand cybersecurity requirements. I also talk to the team about ongoing efforts and improvements that we can make to our processes. As a supervisor, I also work with everyone in my branch to make sure they have what they need to be successful in their jobs and in the efforts they are supporting.

What drew you to the STEM field originally? Both of my parents had computer science careers. From the time when I was very young, they had computers in the house I could use for learning and experimentation. I always thought it was fun to find a new way of doing something with computers or solve new problems with them. I learned how to do computer programming so I could write my own programs to solve problems when I was not able to find an existing solution.

Why is STEM important to our national security and our national future?

Technology is an increasingly large part of everything our nation uses, including the systems we use for our defense. Specifically related to my field, software is built into almost every DOD system. It is critical that the software in all of these systems is built securely to ensure it will be reliable without becoming vulnerable to exploitation.

What is the most important STEM-related innovation you've witnessed in your career? I've seen tremendous changes in the cybersecurity field during my career.

The sophistication of our adversaries has grown over the years, and defending against those risks is increasingly challenging. Today, we must secure systems not just by looking at one particular item but by applying many different fields and types of STEM knowledge to secure every level of the system.

What is your favorite technology for personal use? I enjoy tinkering with new technology and being on the "bleeding edge." I especially like learning about "maker" devices like the Arduino and Raspberry Pi. It's fun to use them for interacting with things in the real world, like building sensors to report data back to webpages.

What is the next great technological frontier? Machine learning and artificial intelligence are rapidly emerging as a foundation for many new types of approaches across STEM, including cybersecurity. Our team has been able to develop some novel uses of machine learning to secure software, and I'm seeing similar efforts across the Army and beyond.

Why is it important for engineers and scientists to engage with STEM Outreach? Outreach events foster interest in scientific fields of study among students. Eventually, these students may end up in advanced careers within DOD, enabling the Soldier to benefit from their scientific education. Our engineers and scientists provide background information regarding how STEM is applied to Army systems. Their knowledge is an essential piece in forging a workforce capable of supporting the Army's mission in the future.

STEM Activity/Challenge

Materials:

- Popsicle sticks
- Paper, cardstock, cardboard
- Aluminum foil
- Paper towel roll tubes
- Small plastic cups
- Aluminum foil
- String or rubber bands
- Pipe cleaners
- Straws
- Tape
- Plastic spoons
- Other useful items in your home

(Optional) Materials to test device:

- Small tub of water or flat bowl
- Cranberries (or use grapes or blueberries instead)

Resource:

www.oceanspray.com/en/our-story/about-the-harvest

Cranberry Harvest

Fall is a big harvest season for cranberries. Most cranberries are wet harvested. This process involves a bog, which is wetland with soft marshy ground that accumulates peat. The night before cranberries are harvested, the bog is flooded with up to 18 inches of water. Water reels are then used to mix the water, allowing the cranberries to loosen from the vine. Due to tiny air pockets inside, the berries float to the water’s surface. Farm workers then move the cranberries toward an elevator that removes them from the water and deposits them in a truck for transport.



Ask an adult to
Share your STEM
on Facebook.
Use **#C5ISRCenterSTEM**

Mission: Bailey Farms is getting ready to harvest their cranberries, but their cranberry collection machine just broke down. You have been hired by the owner of Bailey Farms to design a device to harvest cranberries from the water and move them to the truck.

Design Process:

ASK: What is the problem you need to solve? Design a device that will allow farmers to harvest cranberries quickly.

IMAGINE: Brainstorm and decide on one idea. How will your new device collect the cranberries?

PLAN: Draw a picture of the new device. What will your device look like?

CREATE: Use the materials to create a prototype of your design.

IMPROVE: How can you improve your device?

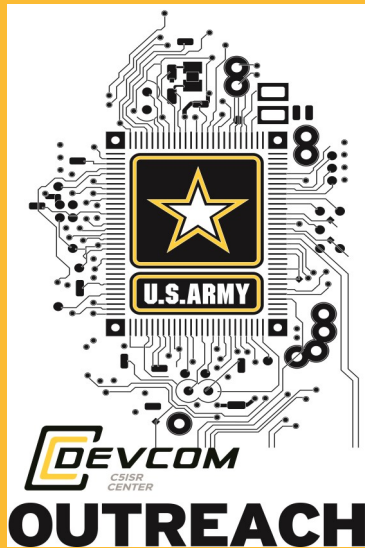
STEM IS YOU...

The C5ISR Center Community Outreach Office is excited to announce two new virtual STEM@Home programs...

STEM STORY HOUR— Dec. 9 at 5 p.m.—Story Hour will engage students grades K-2 through an interactive reading of a children's book followed by a related hands-on STEM activity.

Middle School STEM Night—Dec. 15 at 5 p.m.— Students grades 6-8 are invited to Join us to talk STEM with a world-class Army Scientist or Engineer, play trivia, and learn about the future of STEM in the Army

To Register Visit <https://usarmyc5sircenter.submit.com/>



STEM IN THE NEWS

Did you know?

Around 400 BC, the ancient Greek inventor Archytas of Tarentum built one of the world's first robots: a wooden pigeon that used steam power to fly through the air.

Sources:

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www.hackster.io/news/amphistar-can-run-on-land-and-water-thanks-to-a-sprawling-set-of-propellers-d26f8e984927

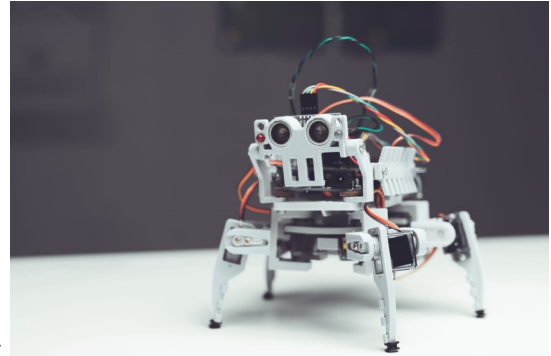
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www.eurekalert.org/pub_releases/2020-11/aabu-cal110220.php

New Robot Can Run on Land and Swim Underwater

Researchers at the Ben-Gurion University of the Negev in Israel have engineered a new robot capable of crawling up and across multiple types of terrain on land – including rock, grass, mud, and sand – and it can run across the surface of water as well as dive and submerge! The robot is named

AmphiSTAR, and it is small enough to fit in the palm of your hand. Dr. David Zarrouk, director of the Bio-Inspired and Medical Robotics Laboratory in the university's Department of Mechanical Engineering, along with graduate student Avi Cohen, presented the AmphiSTAR virtually at the International Conference on Intelligent Robots and Systems held in October 2020.



AmphiSTAR was inspired by the movement of cockroaches, lizards, and frogs.

Cockroaches are typically considered scary and unsanitary, but their motor function, with each leg operating on its own, is mimicked in the AmphiSTAR's supreme scurrying skills on land. Basilisk lizards have special toes on their rear feet that increase their foot's surface area when they make contact with the water. Their high speed when sprinting creates pockets of air that allow them to stay on top of the water's surface. This was the inspiration for AmphiSTAR's ability to move across the top of the water. Frogs start their lives in water as tadpoles, with external gills that allow them to breathe underwater, but they soon develop lungs and legs so they can live on land. Like a frog, AmphiSTAR can operate on land, on top of the water, and underwater.

AmphiSTAR is a wheeled robot that is fitted with four propellers. The propellers allow the robot to walk on land and maneuver through difficult terrain, and they also act as fins and flippers to propel the robot across the water's surface and underwater. AmphiSTAR is fitted with two air tanks that can switch between different modes to inflate or deflate on demand, allowing the robot to stay afloat or submerge.

Dr. Zarrouk said he envisions the AmphiSTAR being used in scenarios in which a robot would need to be able to crawl and swim, such as agricultural applications, excavation expeditions, and search-and-rescue efforts. In the near future, Dr. Zarrouk stated the next steps will be focusing on scaling up the robot to make it bigger and to improve the functionality of its underwater swimming capabilities.

eCYBERMISSION: ACCEPT THE CHALLENGE



The Army Educational Outreach Program (AEOP) eCYBERMISSION registration is open for students, team advisors, and volunteers! eCYBERMISSION is a web-based STEM competition that helps students grades 6-9 learn about real-life applications of STEM. Teams of three or four students are instructed to ask questions or define problems and then construct explanations or design solutions based on identified problems in their community.

Learn more at <https://www.usaeop.com/program/ecybermission/>.

STEM Activity/Challenge



Cranberry Secret Message...

With Thanksgiving just around the corner, have some fun experimenting and decoding secret messages with cranberries, a common side dish that is usually on the table for dinner. Cranberries are native to North America, and in the past, Indigenous Peoples used cranberries for food, dye, and medicine. This simple experiment is a great way to explore acids and bases while having some fun uncovering secret messages.

Materials:

- Cranberry juice or cranberry sauce
- White paper
- 3 tablespoons of baking soda
- 1/3 cup of warm water
- Casserole dish or cake pan
- Writing tools: small paintbrush, Q-tips
- Optional: hair dryer, spray bottle

Directions:

1. Make your invisible ink by mixing about 3 tablespoons of baking soda with 1/3 cup of warm water. If the mixture does not dissolve completely, it is ok.
2. Dip your writing tool in the baking soda mixture, and write a secret message or draw on your paper.
3. Allow the message to dry while you prepare the cranberry decoding juice. For faster drying results, you can use a hair dryer.

4. Prepare your cranberry decoder:

If you have cranberry juice, pour your juice into a glass and use a paint brush to lightly coat your paper. You can also use a spray bottle, which could give you a clearer message.

If you have cranberry sauce, empty the can of cranberry sauce into your dish or pan, mash up the sauce, and spread it into an even layer. For about 30 seconds, firmly press your paper on the side that has the secret message. Do not submerge your paper into the sauce.

5. Read your decoded message. You should have noticed that your baking soda message turned a bluish-green color.

The Science Explained:

This simple experiment uses the chemistry of acids and bases. The cranberry juice (or sauce) is an acid, and the baking soda is a base. Cranberries contain pigments called anthocyanins, which is what gives them their bright red color. These pigments change color if they come in contact with an acid or base. Cranberries are very acidic, and the pigment is red in acids, but when you mix it with a base, it turns blue.

When you painted or pressed your message in the cranberry mixture, the baking soda made your message on the paper less acidic, which caused the cranberry color to change from red to bluish-green. In the end, it results in your secret message being revealed!

Source: littlebinsforlittlehands.com/cranberry-secret-messages/



SAFETY NOTICE

Make sure you have an adult's permission and supervision before beginning this activity.