

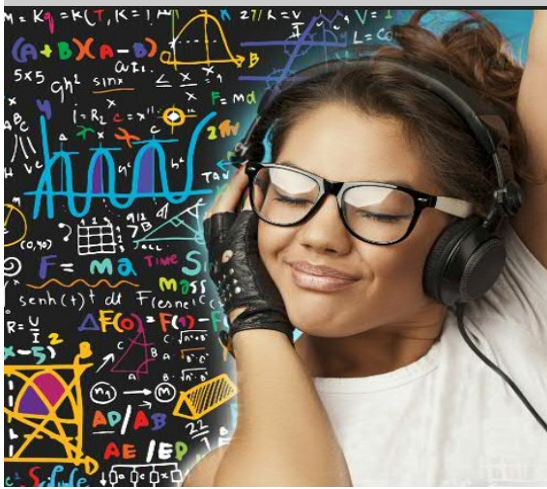


C5ISR CENTER STEM@Home

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.

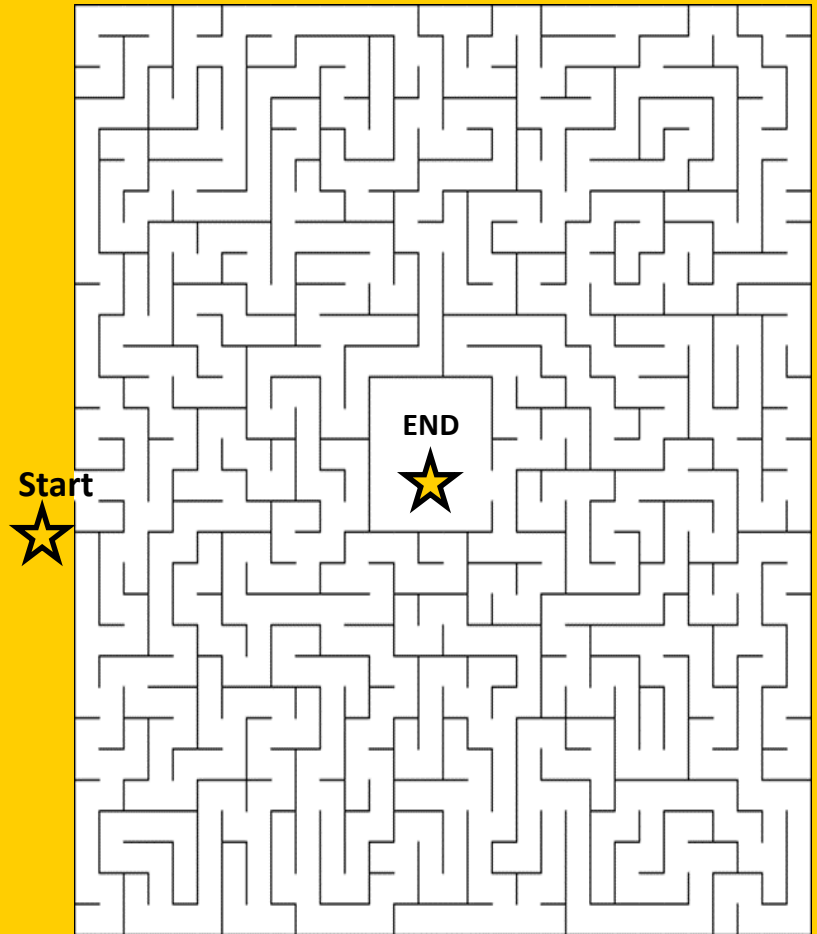


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Brain Teaser: Escape the Maze



Solution on Page 3



SHARE YOUR STEM!

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

#C5ISRCenterSTEM

[Facebook.com/DEVCOM.C5ISR](https://www.facebook.com/DEVCOM.C5ISR)



Introducing Dr. Rich Nabors


Name:

Dr. Rich Nabors

Job Title:

Acting C5ISR Night Vision and Electronic Sensors Directorate (NVESD) Principal Deputy for Systems and Modeling & Simulation/Associate Director for Strategic Planning

Length of Time as an Army

Civilian: 18 years

Education:

"I've gone to lots of colleges and universities – seven at last count. I have college degrees in management and history and started too many other things to count. Education never ends!"

How does your job support the U.S. Soldier? My job is to ensure that the Army's great engineers and scientists have the tools needed to allow them to develop awesome technologies to support our Soldiers. I also help our Soldiers, scientists, and engineers come up with good ways to apply technology to help our Soldiers.

What is a typical day or a week like for you? One of the things that really excites me about my job is that every day is different, filled with its own challenges, opportunities, and experiences. On a given day, I may give an interview for a magazine or budding STEM students, and the next day I may be briefing a general officer or member of congress on some important items to the Army. On another day, I may meet with foreign military folks or sit down with our engineers, scientists, and Soldiers to plot out new technologies we can give our Soldiers. I kind of imagine myself like Tony Stark, except I don't have the cool suit of armor or \$45 billion in my bank amount and no friends named Black Panther or Ant-Man.

What drew you to the STEM field originally? I grew up in a military family and had the opportunity to live in lots of other places while I was growing up, and I made lots of friends who were Soldiers, Sailors, and Marines. Some of the Soldiers really liked me, and they taught me about the Army and inspired me to try to do my part to support our armed forces. It was the best decision I ever made.

Why is STEM important to our national security and our national future? STEM is really the engine that drives a lot of the cool stuff coming out of the country, and it is definitely critical to making the U.S. and the whole world a better place! STEM folks have real challenges in front of them. Without STEM, things may not be very good in the future. Our STEM professionals will have to help protect our climate, ensure the people of the world have enough food and water, develop cures for new diseases, travel to Mars and other planets, and all sorts of great things. I sleep very well at night knowing we have some really great and talented folks in the STEM fields that not only meet every challenge but surpass all expectations! Shout out to my son Fletcher, who is 16 and on his way to being an awesome computer scientist!

How should students further their interests in a STEM field? Engage with your teachers, talk with your parents, watch Marvel movies (nothing gets me more inspired than watching *Iron Man*), go out on walks, bake a cake, create a video game—do what you enjoy. STEM experiences are everywhere! You just have to look and remember to enjoy the journey to becoming a STEM professional, which is the best part!

What is the most important STEM-related innovation you've witnessed in your career? I am amazed at how we've been able to make better and better night vision technologies and link them to some of the really neat commercial products out there. It's awesome seeing how the military's projects and companies' developments can come together to help our Soldiers. It's also great seeing Army technology used outside of the military to support our firefighters, police officers, doctors, and astronauts.

What is your favorite technology for personal use? I am a huge fan of video games. My favorite technology for personal use is my gaming console device. One of the cool things I can do in my job is take some of the real cool ideas we see in video games and apply them to what we are doing for Soldiers. You'd be surprised at how many cool things you can come up with on Minecraft that can be applied to the real world! One of my mentors turned something he saw in a video game into something that will soon be used across the Army—how cool is that?!

What is the next great technological frontier? The next great technological frontier is artificial intelligence. I think we are on the cusp of seeing some real breakthroughs here. My Alexa can now talk to me on my watch. That is awesome. Hopefully we can get something like this to our Soldiers soon!

Why is it important for engineers and scientists to engage with STEM Outreach? STEM Outreach is our future; we seek to inspire and motivate future STEM professionals—any one of you could be the next innovator that discovers and advances technologies enabling us to save lives and keep our Soldiers safe. Thanks to everybody working in STEM!

STEM Challenge

Materials:

- Popsicle sticks
- Paper, cardstock, or cardboard
- Paper towel roll tubes
- Small plastic cups
- String or rubber bands
- Small paper cups or bowls
- Pipe cleaners
- Straws
- Tape
- Cotton balls or pompoms
- Aluminum foil
- Saran wrap
- Bubble wrap
- Other useful items in your home

Materials to test:

- Plastic egg or hardboiled egg (Make sure to wash your hands and use items that could get messy)
- Heavy item to place on top, such as a heavy book

Ask a grownup for permission to use these items.



Protect the Egg Challenge

Does your mobile phone have a case? What about your tablet? Technology can be fragile, and one of the things our engineers have to do is make sure there are ways to protect it and keep it safe.

Mission:

While on a walk, Mr. Hank noticed a nest with eggs on the ground. Mr. Hank grew concerned about the eggs, as there was an ice storm on the way. He contacted you as an engineer to design a strong nest that will protect the eggs from the ice storm. Mr. Hank wants to ensure that the nest will be strong enough to protect the egg from falling ice chunks.

Requirements:

- Nest must be strong enough to be able to protect an egg from breaking.
- Nest should stand on its own without help.

Design Process:

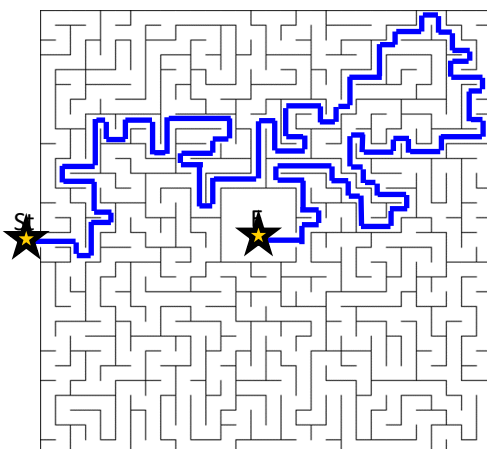
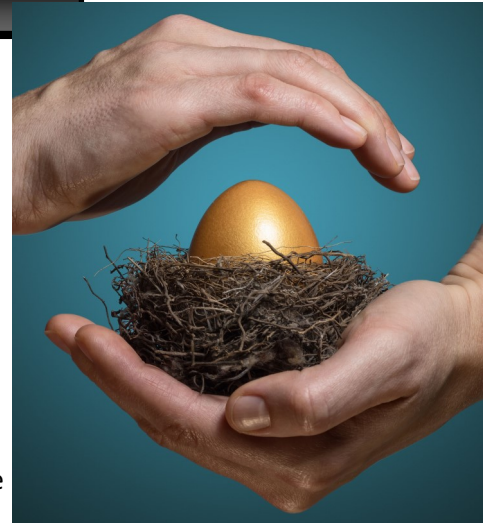
ASK: What is the problem you need to solve? Find a solution to prevent an egg from breaking when a heavy item is placed on top.

IMAGINE: Brainstorm and decide on one idea. How will you design a strong nest to protect the egg?

PLAN: Draw a picture of your nest to protect the egg. What will your nest look like?

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

IMPROVE: Test your nest to see if it can protect an egg. How can you improve your nest?



Ask an adult to Share your STEM on Facebook.

[Facebook.com/DEVCOM.C5ISR](https://www.facebook.com/DEVCOM.C5ISR)

#C5ISRCenterSTEM



GET YOUR STEM ON...

The C5ISR Center Community Outreach Program is dedicated to providing quality STEM programs to students K-12. For more information about our STEM Outreach Programs, visit us on the web:



https://c5isr.ccdc.army.mil/student_programs/

*Due to COVID-19, programs are currently virtual.

STEM IN THE NEWS

The Science of Siestas

A siesta, or a daytime nap, has sometimes been perceived as controversial. There are countries, like Spain, where a siesta has long been a part of their culture but is now discouraged. On the other hand, there are now some companies in the United States that are promoting a quick daytime nap as a way to boost productivity. Recently, it has been tested and discovered that how often people nap, no matter their origin or background, is partly regulated by their genes.



Scientists and doctors at the Massachusetts General Hospital conducted the largest study of its kind to identify gene regions that control a person's likelihood to take naps during the day. Collaborating with doctors and researchers from the University of Murcia in Spain and several other institutions, the team used databases of genetic and lifestyle information to study aspects of sleep such as sleep duration, insomnia, and the tendency to be an early riser or a "night owl."

For this study, a genome-wide association study (GWAS) was conducted. A GWAS involves a rapid scanning of complete sets of DNA, or genomes, of large amounts of people. The primary goal of a GWAS is to identify genetic variations associated with a specific disease, or in the case of this study, a particular habit.

To start, the team used data from biomedical databases and research resources in the United States and United Kingdom. Participants of the study were asked how often they napped during the day, and were asked to record answers on a Likert scale. The GWAS was able to pick out 123 regions of the human genome that are associated with napping. A subset of these participants wore monitors that provided data about their daily movements, which can be an indicator of napping. The data collected was an indicator that the reports about napping were accurate.

The data also provided additional indicators that promote napping: sleep propensity, which means that some people need more sleep than others; disrupted sleep, or needing a nap to make up for a bad night's sleep; and early morning awakening, meaning people that wake up early might need to catch up on sleep with a nap.

This study shows that "daytime napping can be biologically driven and is not just an environmental or behavioral choice," said Dr. Hassan Saeed Dashti of the Massachusetts General Hospital Center of Genomic Medicine. Future work and data may help to develop your own personalized recommendation for a siesta.

Sources and Resources:

[www.sciencedaily.com/
releases/2021/02/210210133305.htm](http://www.sciencedaily.com/releases/2021/02/210210133305.htm)

[news.harvard.edu/gazette/story/2021/02/the-science-
behind-those-afternoon-naps/](http://news.harvard.edu/gazette/story/2021/02/the-science-behind-those-afternoon-naps/)

Nap Joke:

After the C₀2 molecule left the car, it immediately took a nap.

It was exhausted.

STEM Activity/Challenge

Color-Changing Oobleck Experiment

Spring is on the way, and one of the best parts of spring are the beautiful flowers that begin to pop up. In honor of the colors of spring, this month's experiment with Oobleck has an extra twist— we will be using chemistry to make our Oobleck change colors.

Materials:

- Measuring cup
- Clear mixing bowl
- Spoon, baster, straws, or pipettes
- Pot
- Strainer
- Half a head of red cabbage
- Water
- Vinegar
- 1 tablespoon of baking soda
- 1 ½ cups of corn starch
- Ziploc bag or container with lid to store the Oobleck

DIRECTIONS: (**WARNING—THIS EXPERIMENT CAN GET MESSY!**)

1. Prepare your pH indicator from your red cabbage.
 - Coarsely chop up half a head of red cabbage and boil for 10 minutes until the color has been transferred from the cabbage to the water.
 - Use a strainer to strain the liquid from the cabbage into a container and allow the liquid to cool. You now have your pH indicator.
2. Prepare the base for your color-changing Oobleck.
 - In a large bowl, mix together ½ cup of your pH indicator (the red cabbage liquid) and 1 ½ cups of corn starch.
 - Mix the two ingredients together until you get a dough-like consistency. Add more cornstarch if the mixture seems runny, and add more liquid if it seems to stiff. It will not feel like Oobleck yet, as we need to add additional liquids in the next steps.
3. Divide the dough into two sections in your bowl or dish and make note of the pale purple color of your substance.
4. Prepare your acids and bases: Use 2 small cups. In your first cup, create a mixture with 1 tablespoon of baking soda and 2 tablespoons of water. Stir until it is dissolved. Fill your second cup with 3 tablespoons of vinegar.
5. Use one of your basters, spoons, or pipettes to transfer vinegar into one of your divided section of the Oobleck dough. Mix the ingredients together using a spoon or your hands. You should notice that it turns pink, indicating an acid.
6. Use a different baster, spoon, or pipette to transfer your baking soda mixture to your other section of the Oobleck dough. Mix the ingredient together well. You should notice that that it turns blue, indicating a base.
7. Play with your Oobleck sections and notice how the colors move and travel through the mixture as it becomes solid then liquid. You may notice it starting to turn bluer. If you add more vinegar, you will notice that it will turn pink again, and you may even see bubbles form, which show the chemical reaction taking place.
8. Mix your pink Oobleck with the blue and observe how the Oobleck behaves and the two colors interact. What color did your mixture change when you combined the acidic side and basic side of your Oobleck together?

SAFETY NOTICE



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

Resource:

www.steampoweredfamily.com/activities/a-year-of-oobleck/

The Science Explained

Since Oobleck is a mixture of cornstarch and water, it takes on properties of both a liquid and solid. The relatively large, solid cornstarch molecules form long chains, while the smaller water molecules flow past one another in between the cornstarch molecules, allowing the chains to slide and flow around each other. This is what makes Oobleck behave like a liquid when it is not under pressure. When you squeeze Oobleck, the water is forced temporarily out of the mixture, causing the starch molecules to press against each other and making the mixture behave like a solid.

The second part of this experiment explores chemistry and the properties of pH, which allowed us to create the color-changing Oobleck. The pH indicator (cabbage water) started out at neutral pH of 7. When it came in contact with the acid (vinegar), it turned pink, and when it came in contact with the base (baking soda mixture), it turned blue.

The big question is why the mixed Oobleck turned completely blue.

When you combined the acid side of the Oobleck with the basic side, you created a chemical reaction. You may have noticed little bubbles that formed in the Oobleck when the two divided sides were combined. During the reaction, the acid was neutralized by the base. With the pH solution Oobleck base starting out as a neutral pale purple, it led the mixed Oobleck to turn blue and become more basic.