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**Agricultural Engineering**

Every month, we feature a different type of engineer so that you can see all the ways that engineers improve our world. This month, we focus on Agricultural Engineering.

It's Harvest time…but first the crops have to grow! Agricultural Engineers find ways to get crops the proper nutrients, design harvesting machinery, or work on the disposal of agricultural wastes. Modern Agriculture is a high-tech industry. Agricultural Engineers work with production facilities, food engineering, physical and chemical properties of materials, power, waste, and water management and the sales and services within the agricultural industry.

As an Agricultural Engineer you might develop new biofuels or refine hydroponics – the science of growing crops in water. Agricultural Engineering is of huge importance as the population is increasing at a rapid rate and to feed this population is a mammoth task. The most efficient mechanized and planned farming is required.

Learn more about Agricultural Engineering by watching these two videos below.

- **What is Agricultural Engineering?**

- **What Do Agricultural Engineers do?**

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**Meet Ashley, Agricultural Engineering student**

Ashley is a sophomore at the University of Tennessee – Knoxville studying Biosystems Engineering, a subset of Agricultural Engineering. She grew up on a small farm in Thompson's Station, Tennessee where her family had horses, cows, chickens, goats, cats, dogs, and more. She loves animals, agriculture, and the outdoors. She has been horseback riding since she was 7-years-old and now rides on the equestrian team at college.

Ashley was very involved in a 4-H program in high school which catered to her interests in animals and agriculture as well as leadership and service. Ashley looked for a college major that would lead her to a career including all of these interests, which led her to Biosystems Engineering. Ashley says "Biosystems Engineering is a little different than the straightforward Civil, Mechanical, or Electrical Engineering since it encompasses pieces of each of those in order to address agricultural-based problems. Its broadness creates a range of options for its graduates, and in my opinion, it is a hidden treasure because it allows me to do everything I could possibly imagine."

Ashley plans to work with her university or a company who focuses their work in less developed regions of the world. Some of her professors have worked in Rwanda, Cambodia, and Guatemala. She hopes to be an international specialist in agriculture in order to help improve the quality of life for citizens of other countries. Ashley concludes "Whether the issue is water access, food access, economic state, or education, I want to be a catalyst for change, and my engineering degree will enable me to do so."

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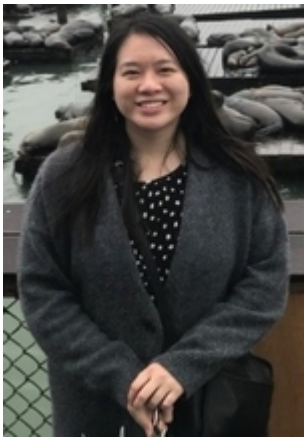
**Advice from Agricultural Engineering college students**

**Nasrin** is an Agricultural/Biological Engineering Major at the University of Illinois. She is learning about renewable energy biofuels and bioprocessing engineering which combines math, biology, and industrial design.

Nasrin's advice to SWENexters: "Get involved in SWENext or any club at school early on. If possible, run for leadership positions or take initiative when working on class projects. It is so beneficial to know people in your classes and gain technical/group work experience."

**Alice** is also an Agricultural/Biological Engineering Major at the University of Illinois. At college, she has learned biology



and chemistry principles that allow her to understand how food production works. It also helps her think about how we can one day relieve food shortages which is important to the world, but also to Alice. She picked this major because it combines her love to solve puzzles with her love of food.

Alice's advice to SWENexters: "Find something you're passionate about and pursue that passion. Life is a long, interesting journey so find something you're interested in exploring but don't ever feel like you're stuck with one thing forever. It's never too late to change the path you've taken."

**Jenna** is studying Biological Systems Engineering at the University of Wisconsin-Madison. Why did she pick her major? She says, "Agricultural Engineering appealed to me because it incorporates so many different disciplines into one. Perhaps more important, however, is the fact that we have the opportunity to apply that vast body of knowledge to a variety of real-world problems that have a positive impact on human lives"


**Megan** is an Agricultural Engineering major at California State Polytechnic University, San Luis Obispo. She was interested in Agricultural Engineering so she could help make agricultural practices more sustainable. When she graduates, she hopes to work with others to implement more sustainable farming and water practices.

Megan's advice to SWENexters: "My advice to anyone wanting to become an engineer is don't let anyone tell you it is too hard. With enough hard work and persistence, anyone can become an engineer."

**Annie** is an Agricultural Engineering major at the University of Arizona. She picked Agricultural Engineering because she wanted to do engineering design along with field work outside. She was also interested in increasing conservation and sustainability. She is focusing on water resources engineering to design flood control structures or improving agricultural practices to be more environmentally friendly.

Annie's advice to SWENexters: "As a woman in STEM, I would say that it's important to focus on your own aspirations and goals. There are lots of resources available for success from family, educators, and organizations. The important thing is to take advantage of what resources and opportunities you have and to have the courage to stick up for yourself and pursue your goals."

**Invitation for SWE Nexters – Be featured in an upcoming newsletter**

Would you like to be featured in the SWENext Newsletter? Tell us why you love STEM! Tell us what you have done as a SWENexter! We'd love to hear from you. Feel free to send us an email at **swenext@swe.org**.

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**Fun books on Engineering**

Not sure what to do on a cool fall weekend? Read a fun book about engineering! There are lots to choose from.


**Nick & Tesla Series** (By Steve Hockensmith and Bob Pflugfelder)

Nick and Tesla, 11-year old twins, are budding inventors and detectives who live with their inattentive scientist uncle Newt. Each story is an action-packed mystery to solve using science and technology. Directions for some of the projects are included so readers can try them at home.

**Franny K. Stein, Mad Scientist Series** (By Jim Benton)


Get ready to laugh because Franny's adventures will crack you up! Franny is a socially awkward, mad scientist kid whose science and tech experiments end in complete disaster — all for your reading pleasure, of course.

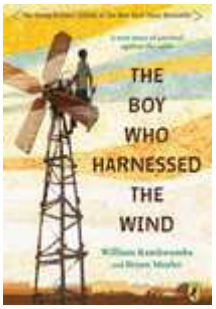

**Super Cool Tech** (By DK)

Just like the title says, this book, with a sleek laptop-looking cover and eye-catching design and layout, showcases the coolest inventions in technology. Not only do you learn about today's tech such as a bionic suit, a floating hotel, or a 3D printed car, but you'll also discover future tech possibilities such as teleportation and artificial intelligence.

**Girls Think of Everything: Stories of Ingenious Inventions by Women** (By Melissa Sweet and Catherine Thimmesh)


Fascinating, well-written stories of female inventors show how inventions such as chocolate chip cookies and windshield wipers came to be. What inspired these women, and just how did they turn their ideas into realities? Read the book and find out!

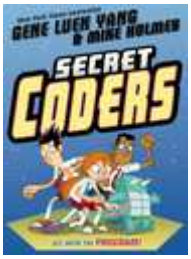
**The Boy Who Harnessed the Wind** (By William Kamkwamba and Bryan Mealer)




An inspiring true story of necessity and invention! Due to a drought, William's African village has no water, no crops, and no income source. He researches solutions in the library and decides to build a windmill which successfully pumps water to the fields and generates electricity for his family.

**Maker Lab** (By Jack Challoner)


Beautiful design and photographs showcase 28 kid-friendly, easy-to-follow experiments and activities. Only household materials are required, there are three levels of difficulty, and kids will learn the real-world science behind each project.




**Secret Coders** (By Gene Luen Yang)

In this interactive graphic novel, Hopper and her friends notice strange things at their new, creepy school including that the birds are robots. To stop the strange birds and the evil janitor controlling them, the kids need your help with logic puzzles and basic programming.

**Strange but True!** (By DK)


It's practically impossible to resist reading this book about the most crazy, extreme, and unusual animals, places, and occurrences in our world. Paired with gorgeous photographs, you'll read about zombie snails, fairy chimneys, killer plants, a crater of fire called the "Door to Hell", and much more.

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**Want to know how to start a SWENext Club?**

SWENext Clubs are a way to connect with SWE members and other SWENexters in your area. Your SWENext Club can be any size with students in K-12 grades. You can work on projects that use engineering to help people in your community, or compete in a competition like Future City Competition or FIRST Robotics Competition. The direction of your club is up to you!

To learn more about how to start a SWENext Club, **check out this helpful guide.**

Questions about SWENext Clubs? Contact us at **swenextclubs@gmail.com**.

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**SWENext Engineering Challenge with a chance to win a freebie**

Agricultural Engineers do a lot of activities that contribute towards the management of our food and water supply. These activities involve designing machines used for farming, controlling our water supply by irrigation, and processing our food products.

One of the many challenges Agricultural Engineers face is how to keep their products fresh from the time they are grown to the time they end up in your kitchen. Engineers can preserve food with various natural and chemical preservatives in addition to using smart packaging.

This month, we're challenging you to **determine the best way to increase the shelf life of strawberries** (or another fruit of your choice!) stored outside of the refrigerator. Your goal is to see if washing strawberries in different solutions protects them from mold or other unwanted discoloration and aging.

You'll need strawberries (or another fruit), water, aloe juice or gel, lemon juice, post it notes or tape, a marker, paper towels, bowls/storage containers, and plastic wrap.

Now start experimenting using the following **procedure**:

1. Purchase strawberries or another fruit of your choice from the store (blueberries, blackberries, etc.). You'll need at least nine berries total for the experiment.
2. Fill three bowls or other types of containers with clean water.
3. Prepare the solutions you'll be using to preserve your berries. Label them using tape or a post it note so you remember which one is which.
   a. Control solution: This will be just water.
   b. Aloe solution: Add aloe juice or aloe vera gel into the water to prepare an anti-fungal solution. Aloe is thought to have properties that keep mold from growing!
   c. Lemon solution: Add lemon juice into the water. Adding acid is thought to protect certain types of produce from discoloration.
4. Set up three separate paper towels for your berries to dry on after washing. Make sure they are also labeled so you don't get the different types of samples mixed up!
5. Wash three berries in each solution and place them on their respective towels to dry.
6. While the berries are drying, set up and label 3 containers to hold your dry trios of berries for aging over time.
7. Once your berries are dry, place them in their respective containers, and cover them completely in plastic wrap. We need to make sure moisture stays in the container with the berries so we can test their resistance to humid conditions over time!

8. Record your initial (day 0) observations stating that all three berries in each group are not discolored and are not moldy.
9. Leave the covered berries outside of the refrigerator but out of direct sunlight.
10. Check on your berries every day for 3+ days. On each day, record how many berries in each group look unchanged, are discolored, and are moldy.

Which one do you think is the best preservative? If you're feeling adventurous, do the experiment again with different preserving solutions!

When you are all done, take a picture of your fruit and let us know which one did best. Then, share it with SWENext! **Each month, a lucky winner will be selected from the submissions to win a SWENext freebie.** Don't miss the chance! All it takes is a few minutes and a great picture. **Please email your entry to swenext@swe.org by November 5.**

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