



Science in Action: Rowan and Gianna

Reader



THIS BOOK IS THE PROPERTY OF:			
STATE _____		Book No. _____	
PROVINCE _____		Enter information in spaces to the left as instructed.	
COUNTY _____			
PARISH _____			
SCHOOL DISTRICT _____			
OTHER _____			
ISSUED TO		CONDITION	
		ISSUED	RETURNED
_____		_____	_____
_____		_____	_____
_____		_____	_____
_____		_____	_____
_____		_____	_____
_____		_____	_____
_____		_____	_____
_____		_____	_____
_____		_____	_____

PUPILS to whom this textbook is issued must not write on any page or mark any part of it in any way, consumable textbooks excepted.

- 1. Teachers should see that the pupil's name is clearly written in ink in the spaces above in every book issued.
- 2. The following terms should be used in recording the condition of the book:
New; Good; Fair; Poor; Bad.

Science in Action: Rowan and Gianna



Core Knowledge®

Creative Commons Licensing

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.



You are free:

- to Share**—to copy, distribute, and transmit the work
- to Remix**—to adapt the work

Under the following conditions:

Attribution—You must attribute the work in the following manner:

This work is based on an original work of the Core Knowledge® Foundation (www.coreknowledge.org) made available through licensing under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. This does not in any way imply that the Core Knowledge Foundation endorses this work.

Noncommercial—You may not use this work for commercial purposes.

Share Alike—If you alter, transform, or build upon this work, you may distribute the resulting work only under the same or similar license to this one.

With the understanding that:

For any reuse or distribution, you must make clear to others the license terms of this work. The best way to do this is with a link to this web page:

<https://creativecommons.org/licenses/by-nc-sa/4.0/>

Copyright © 2025 Core Knowledge Foundation

www.coreknowledge.org

All Rights Reserved.

Core Knowledge®, Core Knowledge Curriculum Series™, Core Knowledge Science™, and CKSci™ are trademarks of the Core Knowledge Foundation.

Trademarks and trade names are shown in this book strictly for illustrative and educational purposes and are the property of their respective owners. References herein should not be regarded as affecting the validity of said trademarks and trade names.

ISBN: 979-8-88970-574-1

Science in Action: Rowan and Gianna

Table of Contents

Chapter 1	Rowan and the Great Creek Rescue	2
Chapter 2	Rowan Smith: Engineering a Greener Future	12
Chapter 3	Gianna's Path	24
Chapter 4	Gianna Scire: Journey to Engineering	34

Rowan and the Great Creek Rescue

Chapter

1

Today is the day! Rowan had been counting down to this very day for weeks.

Her class is going on a field trip to the creek. The class will measure how fast the water in the creek is moving and record the types of critters they see living in the creek. They will also test the water in the creek to see whether it is safe and healthy for the critters there. Rowan couldn't wait to test the water, just like a real scientist.

As the bus bumped along the road, she gazed out the window, imagining all the creatures she might see—frogs, salamanders, dragonflies. It was going to be amazing!



When they arrived, her teacher, Mrs. Green, handed out pH strips, stopwatches, and table tennis balls to each student. “OK, everyone! We’ll be testing the water in the creek. The pH strips will show how acidic or basic the water is. We’ll compare the color of your strip with a color key to find the pH of the water. We’ll use the stopwatches and table tennis balls to measure the speed of the stream. And if you see something interesting, draw it in your journals.

“What we observe and record today will give us an idea of the health of the creek, much like when you go to the doctor for a physical. This can help us understand if it’s a good home for the critters that live here.”



acidic



basic

1

2

3

4

5

6

7

8

9

10

11

12

13

14

Rowan rushed to join her best friend, Mia, by the creek's edge. "Look at all the bugs!" Mia exclaimed, pointing at the water. "This place is alive!" Mother Nature had an audience today. Everyone was waiting to see something new.



Up and down the creek, students were dipping their pH strips into the water. Rowan dipped her pH strip into the water, waiting for it to change color. Rowan looked down at her pH strip. She knew that a pH reading above 7.0 was **alkaline**, and anything under 7.0 was **acidic**. But she had no idea what to expect from the creek water.



But before she could check it, something caught her eye—a tiny frog sitting on a rock. Its skin was speckled with brown spots. It blinked at her with big, shiny eyes.

"Oh, hello there!" Rowan whispered, smiling.

“Rowan, look!” Mia called, showing her pH strip. “Mine’s turning amber. That means the pH is neutral, not acidic and not basic.”

Rowan glanced at her strip, which was also turning amber. “Mine’s turning amber, too. What does that mean for the creek?”



Her teacher walked over. “That color shows the creek is at a safe pH level for the things that live in it. If the creek was too much more acidic or too much more basic, it would not be safe.”

Rowan looked back to the frog. “Well, that’s good for Mr. Frog. Mr. Frog, do you mind if I sketch you?” Rowan took out her journal and started to draw Mr. Frog.

Mrs. Green looked at Rowan and Mia. “Before you get too busy drawing, make sure you measure the speed of the water in the creek.”

Rowan looked down the creek. Mrs. Green had set up a red flag at one end of the creek and a green flag near where they were standing.

"What do you see the other students near the green flag doing?" Mrs. Green asked.

"It looks like everyone is putting their table tennis balls in the water and raising their arms when they do it."

"That's right, Rowan. Mia, what do you think the students by the red flag are doing?" Mrs. Green asked.

Mia looked at the students by the red flag. "They are looking at their stopwatches."

"That's what I would like you two to do. One of you will go by the red flag. Set the stopwatch to zero. When you see your partner's hand go up, start the stopwatch," Mrs. Green said.

Rowan looked at her drawing of Mr. Frog. "I'll stay up here by Mr. Frog so he doesn't think I'm leaving. Then I can finish my drawing of him."

Mia set the stopwatch to zero. "I'll go to the red flag. Give me a minute to get down there."



As Mia walked toward the red flag, Rowan asked, “What will finding out the speed of the creek tell us?”

“If the river is moving at the speed the critters are used to, they live well. This creek usually moves around four miles an hour. That means it should take the ball about two minutes to reach Mia.”

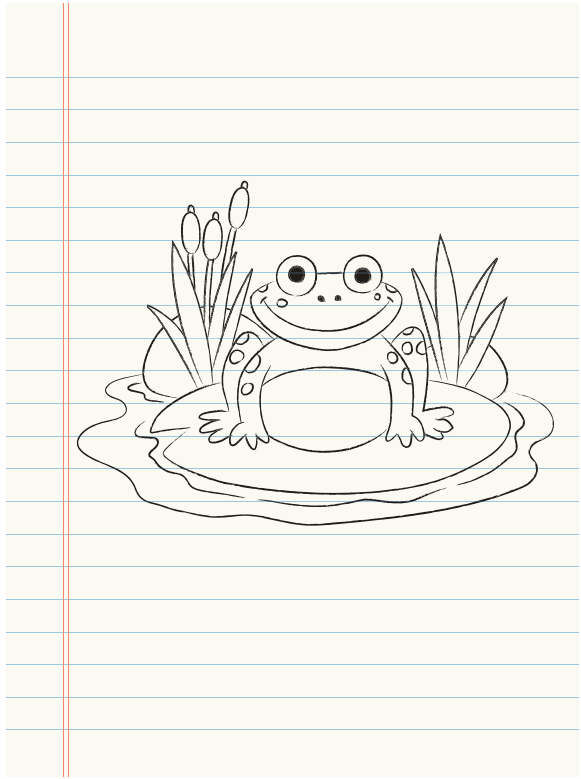
Rowan dropped the ball in the river and raised her arm. She could see Mia start the stopwatch. Two minutes later, Rowan could see Mia stop the watch.



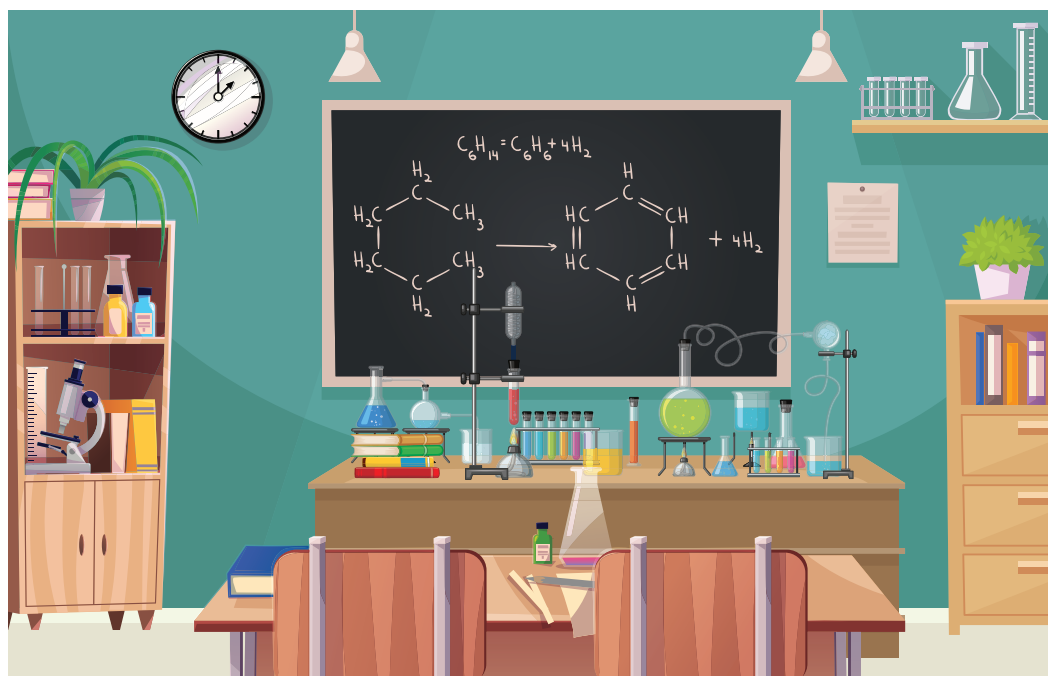
Over the next few school years, Rowan would return to the creek. She and her classmates would make sure the creek was healthy. She would run other tests on the water. She would also observe the frogs and dragonflies and other tiny animals that lived in and on the water.

Instead of drawings of Mr. Frog and charts showing how fast the creek moves, Rowan wrote reports that described the health of the creek, how the class determined the health of the creek, and the variety of critters in the creek.

Although Rowan had to do more academic work, she never lost focus of the important part of the field trips to the creek: Nature is something important that we need to protect and take care of.



When Rowan reached high school, she took her first chemistry class as a sophomore. There was something about chemistry that appealed to Rowan. But the real turning point came during her senior year when she took AP Chemistry, taught by an inspiring woman, Dr. Boyette.



Not only was Dr. Boyette incredibly knowledgeable, but she was also a black belt in karate. She brought a unique blend of strength and intelligence to the classroom. Rowan admired her deeply for making even the toughest concepts engaging and for pushing her students to challenge themselves. AP Chemistry was the hardest class Rowan had ever taken, but Dr. Boyette's support and passion helped her push through the struggles, keeping her excitement for chemistry alive.

By the end of high school, Rowan had to decide. “Mom, Dad, can we talk about college?”

“Sure, what’s going on?” her mom asked. Her mom worked as an electrical engineer and went to film school.

“Well, I like chemistry a lot. Something about it makes sense to me. So, I want to look at colleges with good chemistry programs. But I also see the world needs help keeping the environment healthy so we have a place to live. I might want to do something to help the environment.”

“That’s a couple different choices,” her dad said. Like Rowan’s mom, her dad was also an electrical engineer. He was also a musician. “You like math, and you seem to like a lot of your science classes. Engineers need to have a strong math background.”



“Maybe I also want to be an artist like you or mom. I’m not sure if I want to do mathematics as a career. If I go into environmental studies, I might not get to explore chemistry enough. If I go into chemistry, I might be doing work that ends up harming the environment more than helping it.”

	Pros	Cons
Art	creative	not much math or science
Chemistry	love chemistry	I want to be out in the world, not stuck in a lab
Environmental	help the world	might not do much chemistry
Math	good at it	no chemistry or environmental

“Well, your dad and I will support your decision. You know, once you are at college, the picture might become clearer as you get through more classes.”

Rowan had a lot of decisions to make before she went to college. However, one thing had been clear ever since she was young—whatever career she chose, it needed to focus on helping the world.

Rowan Smith: Engineering a Greener Future

Chapter

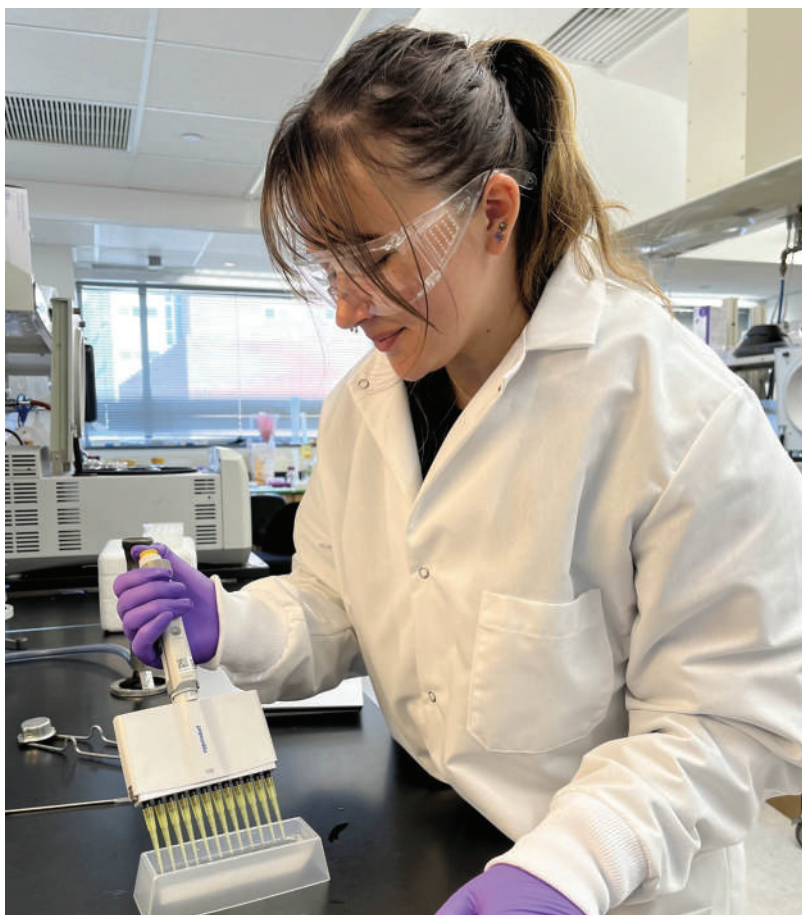
2

Here's Rowan Smith, the chemistry and environmental enthusiast from the last chapter. She is now a young engineer at Rensselaer Polytechnic Institute (RPI) in New York state studying something really cool—chemical engineering! But before we dive into that, let's talk about what a chemist is because that's a big part of Rowan's world, too.

A chemist is someone who studies chemicals and how they react with one another. They do experiments in a lab, like mixing different liquids and powders, to see what happens. Chemists are like detectives who figure out what materials are made of and how they work together. They discover new things that can help make products we use every day, like medicines and fuels for cars! A chemist is someone who is always experimenting, figuring out how different substances react with one another to make something new.



Now, what Rowan does is a little different. Chemists work in labs to make small amounts of things, such as a few drops of a new kind of soap. Chemical engineers like Rowan take what the chemists have discovered and figure out how to make LOTS of it. A **chemical engineer** looks at the process (how it is made) of making a substance and experiments to improve on the process.



Think about it like this: If a chemist makes a new color of paint in a tiny jar, Rowan's job is to figure out how to make gallons and gallons of it so people can paint their houses. In Rowan's industry, this is known as mass production.





In another interesting project, Rowan and her friend made an eco-friendly **biodiesel fuel** made from vegetable oils. They used avocado oil in a little experiment in a lab, and it worked really well.

But when they thought about making biodiesel in huge amounts—like enough to fuel a truck or a gas station—they realized it would be a lot more complicated. There would be more safety concerns, like making sure the machines don't get too hot, and it would cost more money to make it on a large scale.



Biodiesel is a diesel fuel made from biologic materials. Biodiesel can be made from many different sources.

Rather than becoming waste in a landfill, some of these materials can be reused to produce energy. Most of these sources are **renewable** in that the crops can be regrown year after year.

The main use for biodiesel is in larger engines such as those on train engines and generators. While pure biodiesel produces less waste products than regular diesel, specific engines are needed to use pure biodiesel. As a result, biodiesel is blended into regular diesel so existing engines can be used with very few changes. This reduces the use of fossil fuels.

Biodiesel is a great example of how chemical engineers work on sustainable processes. If people could replace all traditional diesel with biodiesel made from vegetable oils, it would have a huge positive impact on the environment!



Soybean, sunflowers, and other plants



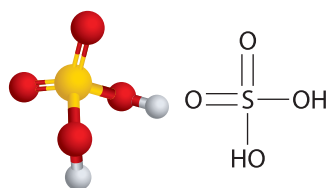
Waste vegetable oil from kitchen fryers



Animal fats such as chicken fat or lard

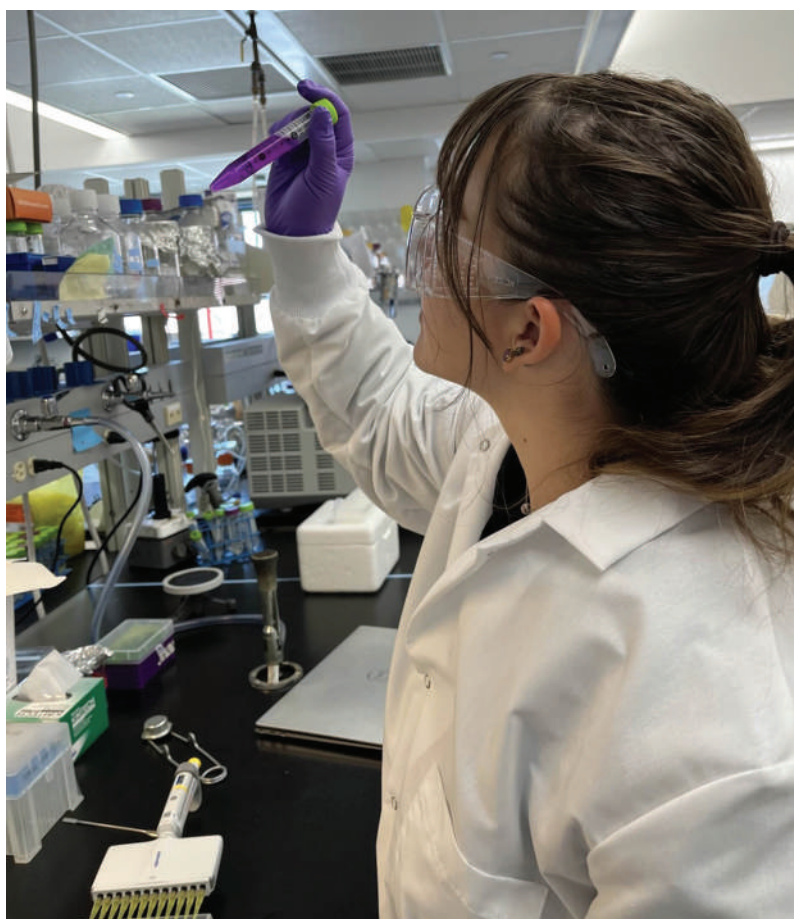
Rowan helps clarify the difference between a chemist and a chemical engineer by giving another example. She says to imagine there is a chemist who discovers a way to make sulfuric acid. The chemist makes a small amount in a lab.

Chemical engineers, on the other hand, figure out how to make gallons of sulfuric acid safely and in large quantities.



Sulfuric acid

According to Rowan, there's a lot to consider when scaling up a chemical process. For instance, a small **reaction** might heat up slightly in a lab, but if you try to do it on a large scale, it could heat up a lot more and explode! It's the job of a chemical engineer to figure out how to cool things down and keep everything safe.

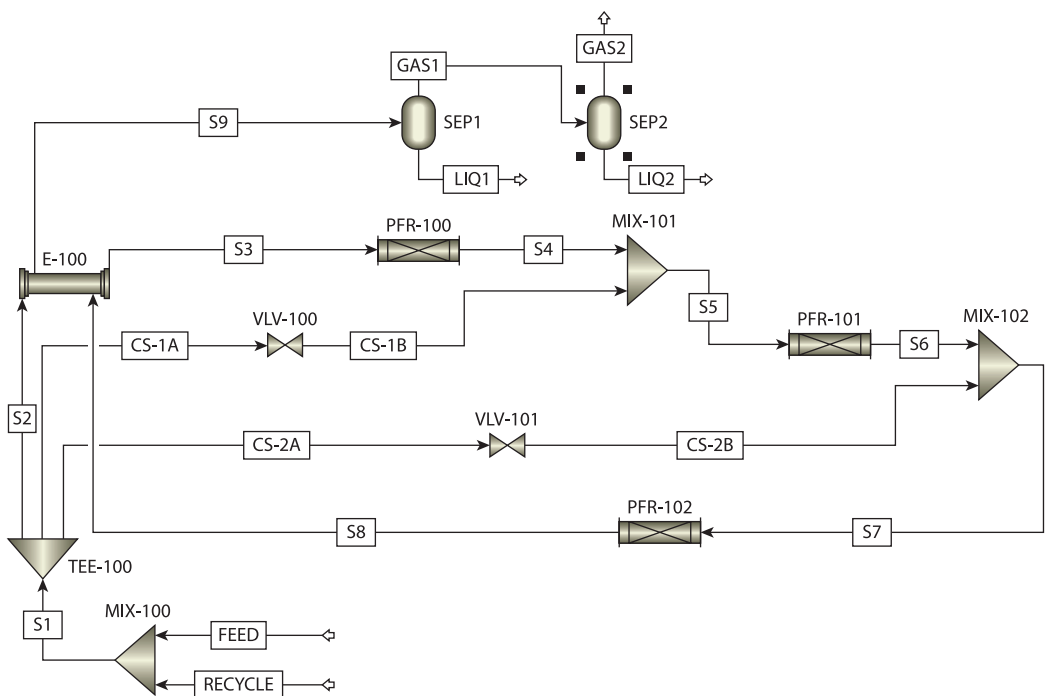


One of Rowan's more exciting projects in school was designing a factory to produce ammonium nitrate, a common fertilizer. It was a team effort, and they used special software to model the plant. Modeling is a part of the design process used to identify the benefits and risks of the thing that is being modeled.



The software helps chemical engineers design factories by letting them input details about the chemicals, and it provides important **data** like temperature changes, energy use, and safety concerns. If a reaction will release too much heat to be manageable or will generate dangerous by-products, modeling can help catch the unwanted side effects. Before the fertilizer is applied to a crop, modeling can help identify the best ways to produce the fertilizer.

Rowan and her partner designed a large-scale plant using the software. Each critical step of the process was identified and represented a portion of the physical plant. The software showed how chemicals would move through reactors and pipes. While the project was done on a computer, the software helped them understand how to safely produce ammonium nitrate, which is very tricky to handle in real life.



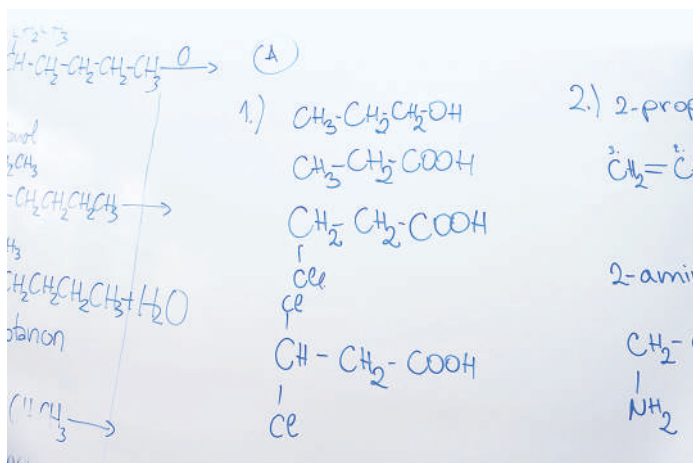
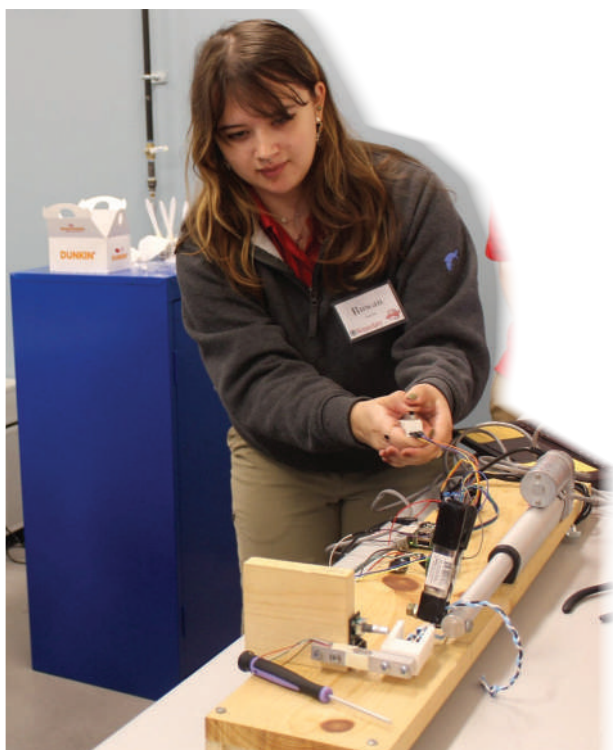
Even though the factory design might not have worked perfectly in reality, Rowan recalls that it was a great learning experience in managing large-scale chemical processes and safety.

When asked whether computers and math are important in chemical engineering, Rowan says yes! Although Rowan hadn't done any **coding** before starting her studies, she quickly learned that using computers is a big part of the job.

Chemical engineers use software to help solve complex problems and model chemical processes, which is a key part of designing everything from chemical plants to new materials.

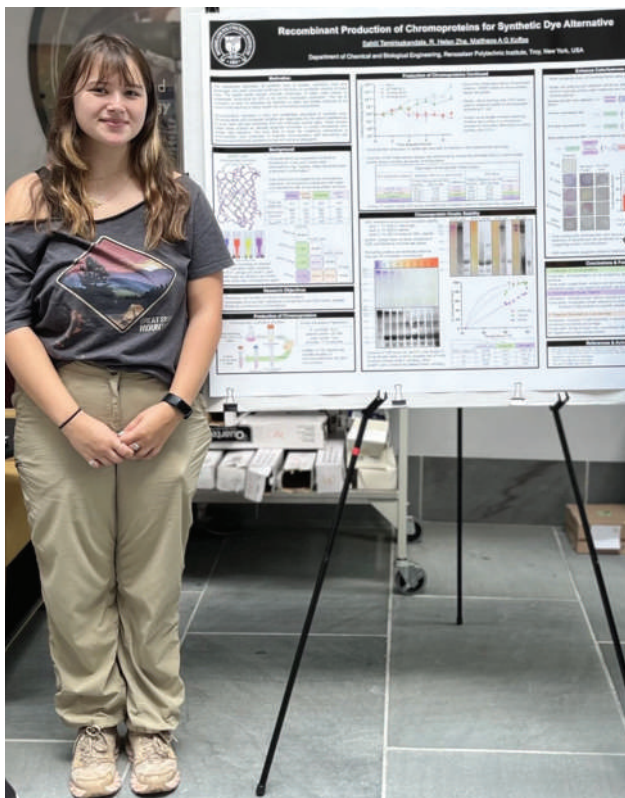
Math is just as important because everything engineers do is based on mathematical models. Rowan explains that variables like temperature and machinery size are all controlled by equations that describe how chemical reactions work. While computers can handle these

calculations, engineers must understand the math behind the equations to fully grasp the results and design effective solutions.



At her university, Rowan is involved in an exciting research project that uses *E. coli* (a type of bacteria) to produce colorful proteins inspired by coral. These proteins can be used as eco-friendly dyes, offering a safer alternative to traditional chemical dyes, which can harm the environment. The project is not only cutting-edge but also aligns with Rowan's commitment to sustainability.

As a woman in a field still dominated by men, Rowan reports that the gender ratio at her university is about 70 percent men and 30 percent women. So, she quickly became aware of being outnumbered in her classes and project groups. Despite that, she has found a strong, supportive community of both men and women who encourage her work. Rowan's dedication to her studies and her passion for environmental engineering have driven her forward, making her an inspiring figure for other young women entering STEM fields.



As she has nurtured her love of chemistry throughout her school years, Rowan has also started to learn the realities of what being a chemical engineer means to her. She is trying to apply her love of the environment to the work she will be doing as a chemical engineer.

Rowan recognizes that climate changes will add many stresses to life on Earth. The population keeps increasing, but crops, meant to feed people and animals, are in more danger from the effects of climate change, such as droughts, flooding, and fires. Another possibility for her future career relates to developing safer fertilizers and pesticides to help maintain crops amid the stresses.



This corn crop has been damaged by drought, hot weather, and pesticides.

Inspired by . . .

To be **inspired** by someone means they made us want to try something.

1867

Marie Curie

Born in Poland



1903

- Won the Nobel Prize in physics for work on radioactivity
- Developed the theory of radioactivity with Pierre Curie and Henri Becquerel
- Invented the term *radioactivity*
- First woman to earn a Nobel Prize



1891

Moved to Paris, France, to study and to conduct scientific work



88

Ra

Radium
226.025

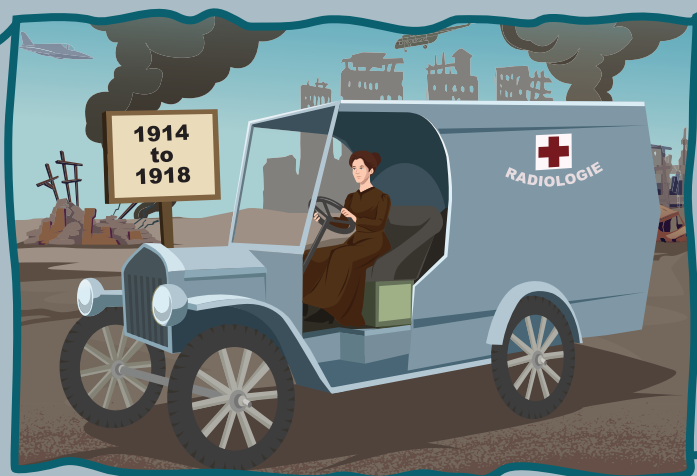
84

Po

Polonium
[208.982]

- Won the Nobel Prize in chemistry
- Discovered two new elements: polonium and radium
- The only person in history to win a Nobel Prize in two different fields

Rowan Smith was inspired by Marie Curie, the first woman to earn a Nobel Prize, one of the most important awards a scientist can receive.



1914 to 1918

During World War I, Curie helped design mobile X-ray machines that doctors used to help injured soldiers on the battlefield.



The uranium, a radioactive material, contained in this bottle makes the bottle glow in the dark.

1934

Marie Curie's work with radioactive materials was groundbreaking but also dangerous. Some radioactive materials give off dangerous radiation as well as light. Over time, the exposure she had to these materials made her very sick. She passed away in 1934. She is remembered as a brilliant scientist and woman in history.

Who inspires you to find out more about the way things happen?
Who has helped you figure out how something works?

Gianna's Path

Chapter

3

"Mom?"

"Yes, Gianna?"

"Can I go with you to work today?"

Gianna's mom was a **veterinarian** at a clinic. Her mother saw many kinds of animals throughout the day, and Gianna liked to help her mom at the clinic. Gianna would help her do medical tests, draw blood samples, and prepare vaccines.



"Gianna, you can come along if you have your piano practice done. Did you play some piano today?"

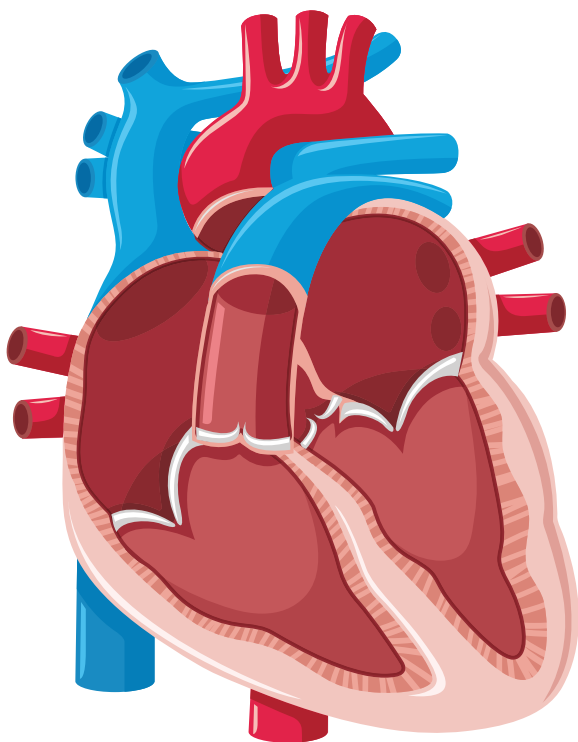
"Yes, Mom." Gianna had been playing since she was three or four years old. She never missed practicing the piano, but she always appreciated her mom's attention.



Gianna could hardly contain her excitement—it was finally happening! She didn't want to be a veterinarian like her mom, but she always liked learning something about bodies and **anatomy**.

In first grade, she dissected a sheep's heart for a science fair. She was eager to understand how blood flowed through its chambers. Her fascination with anatomy and **biology** grew stronger over time.

She also raised caterpillars to learn about their transformation into butterflies! These experiences deepened her appreciation for the natural world. They also showed her how small actions could make a big difference in the lives of living things.



Gianna's interest in anatomy influenced some of her birthday party themes. One year wasn't exactly your typical cake-and-games party. Instead, she set up science experiments and a mini health clinic. Everyone at the party got to see how their hearts beat with electrocardiograms (EKG). With the help of her family, she set up a station where her friends could have their heart activity monitored, just for fun.



Growing up, Gianna wasn't afraid to dive headfirst into new challenges. She played lacrosse as a midfielder, racing up and down the field, always ready to defend or score. Her love for physical activity also led her to karate, where she earned a black belt. Gianna learned to stay calm under pressure, outmaneuver opponents, and push her limits—skills that have stayed with her throughout her life.



In the fifth grade, Gianna stopped playing piano and took up playing the oboe. In addition to the oboe, she also started playing the English horn. Gianna didn't know it at the time, but playing music lets you explore how music is put together. A bunch of individual notes can make up a chord, and a group of chords can make up a verse. A group of verses make up a song or piece of music.



oboe

Making music is also like engineering. In addition to having to play the right notes, you also have to balance the tone and pitch of an instrument along with the musicality. You also have to listen to the other musicians and adjust what you are doing to support them.



English horn

Gianna would eventually win the All State Music Award in Texas for English horn. Her leadership skills truly shined when she became the drum major of her high school's 300-person marching band. The drum major marches at the front of the marching band. Drum majors have many responsibilities. They use their mace to signal the band when to play, when to stop, when to go, and to keep time.



Gianna commanded the attention of the entire band, leading rehearsals and performances with confidence and poise. Drum majors are also the liaison between the band and the other section leaders within a band. Drum majors must memorize the music and keep in mind the cues as the band marches and plays music.

In Texas, where marching band culture is taken seriously, being a drum major is a significant honor and responsibility.



One day Gianna's dad sat down to talk with her about what she wanted to pursue in college.

"Gianna, when it comes to applying to colleges, have you thought about what you want to do there? You are a very strong musician, and a lot of schools would be lucky to have you. You could even have a career in music."

"I'm not completely sure," Gianna said. "My math and science grades are good, but besides that and music, I'm not sure."

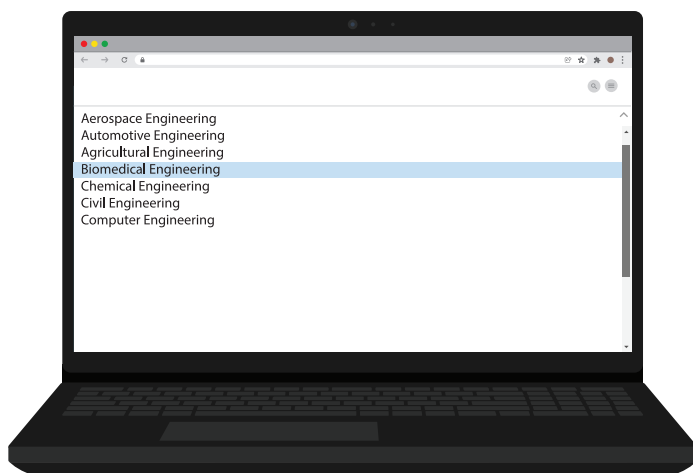
"Well, I think you should look at something with engineering," he suggested. "You like to see how things are put together and how things work."

"I really like music too, though, and I think I should do something with that. I think I should minor in music and major in some kind of engineering."



In calculus class the next day, Gianna decided to look up what kinds of engineering might interest her. She found a long list of options. Aerospace engineering was

engineering related to outer space. She'd get to learn how rockets work maybe, but that wasn't too interesting to her.



Automotive engineering . . . cars are important to help people move around, but that type of engineering wasn't grabbing her. Agricultural engineering . . . she did like working with animals, so that branch would be a maybe. Both were important types of engineering, but she was not passionate about either.

Biomedical engineering . . . now that sounded interesting! She thought about helping her mom out with the different animals, and the sheep heart, and the EKGs they did at her birthday party. When she started researching colleges, she would see if they had **biomedical engineering** programs.



A few weeks later, Gianna was looking at brochures for colleges with her mom.

“Gianna, what’s this pile on the right?”

“That’s my No pile. The Maybe pile is in the middle. The Yes pile is on the left.”

Gianna’s mom grabbed a brochure from the basket. Something caught her eye. “This school has a STEM program. It also has some nice financial aid programs. Maybe you should keep this one in mind.”

Gianna did some more research on the school to see what kinds of engineering programs they offered. She also wanted to make sure they had a music program so she could play in an orchestra. Before she applied, she called her grandparents. They had heard of the school and told Gianna that maybe she should take a trip there to see if she would like going to school there.



When the plane landed, it was snowing. Gianna had gone from warm Texas to cold and snowy upstate New York. She wasn't fond of being cold, but the more she toured the school and the more she met with the staff and students there, the more interested she became in going to school there. The programs they had to offer, both academic and extracurricular, were of interest to her.

Her grandparents spoke well of the school, and Gianna liked it. So, she applied to the school and applied for financial aid. A few weeks later, she received an acceptance letter and a financial aid offer. Gianna decided that was where she would go to college, snow and all.



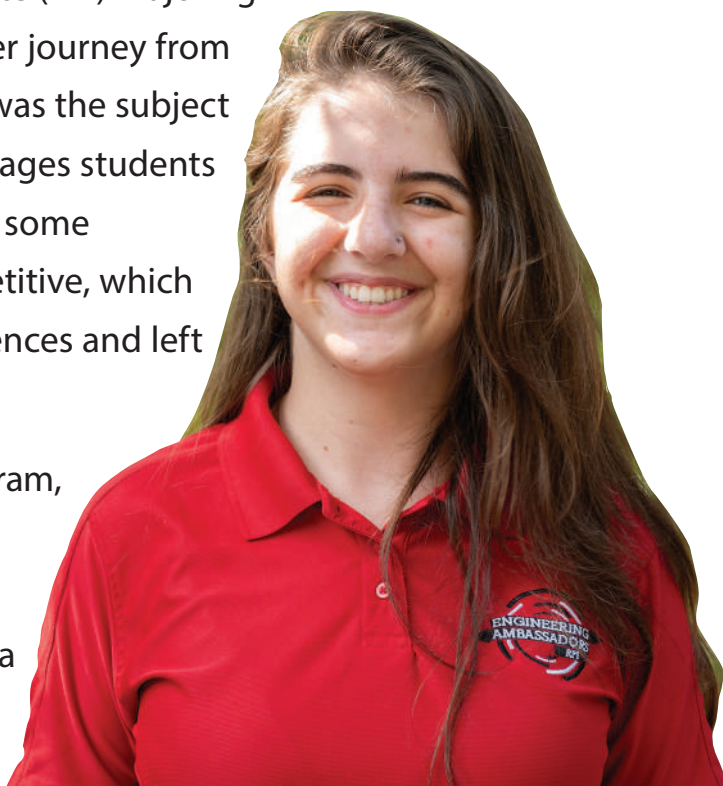
Gianna Scire: Journey to Engineering

Chapter

4

Meet Gianna Scire, an engineering student at Rensselaer Polytechnic Institute (RPI) majoring in biomedical engineering. Her journey from growing up to attending RPI was the subject of the last chapter. RPI encourages students to collaborate. In high school, some advanced classes were competitive, which did not foster positive experiences and left some people feeling left out.

Whether it's in the music program, the biomedical engineering program, or the Engineering Ambassadors, collaboration is a key aspect of college.



Now that she's at RPI, Gianna no longer is a drum major, but because she is working toward a minor in music, she's still busy playing music. Gianna plays the oboe and English horn in various ensembles, including the wind symphony, orchestra, and chamber groups. Every day, Gianna plays her instrument as part of her academic program to earn her minor in music. On the weekends, she practices on her own as well.



The different groups of musicians are all working toward the same goal, much like engineers on a project. For Gianna, music is a break from the demands of engineering—a chance to express herself, collaborate, and focus on something creative. The precision, rhythm, and coordination she practices in music also sharpen her skills in engineering, connecting the two in ways she hadn't expected. She can focus on the completely tangible experience of playing music.

Here are just a few of the colleges that offer engineering programs throughout the United States.

- **California Institute of Technology, known as CalTech**

- Founded in 1893
- Located in Pasadena, California
- Manages the Jet Propulsion Laboratory for NASA



- **Massachusetts Institute of Technology, known as MIT**

- Founded in 1861
- Located in Cambridge, Massachusetts
- School of Engineering makes up 70 percent of the undergraduates



- **Georgia Institute of Technology College of Engineering, known as Georgia Tech**

- Founded in 1885
- Located in Atlanta, Georgia
- Leader in the global transition from an industrial economy to an information economy



Purdue University

- Founded in 1869
- Located in West Lafayette, Indiana
- Known as the “Cradle of Astronauts” for the number of astronauts who have graduated from its programs



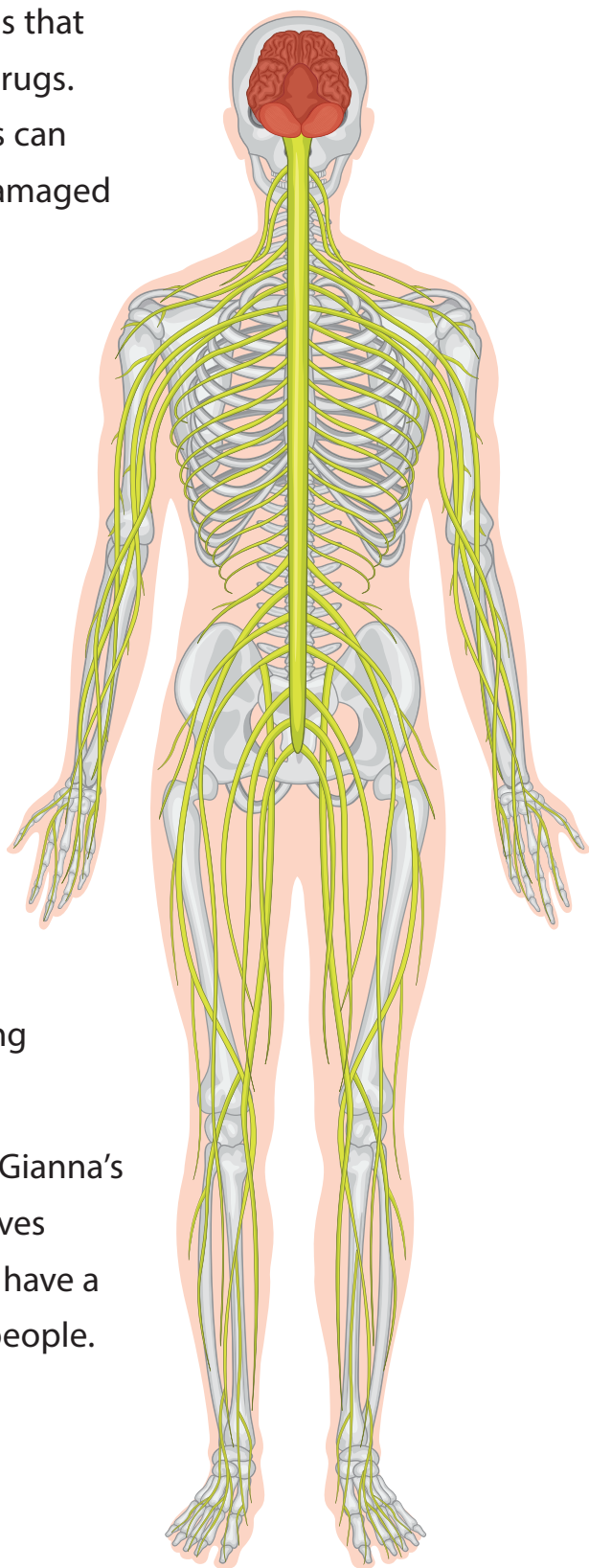
After researching different types of engineering, Gianna discovered the world of biomedical engineering. This discipline allowed her to combine her interests in biology, health care, and problem-solving. She wanted to work behind the scenes, inventing solutions that would improve people's lives.



During her sophomore year at RPI, she joined a research lab that focused on developing materials to aid spinal cord recovery. Nerves that run throughout your body meet up at the spinal cord. The spinal cord runs up your spine and to your brain. When a spinal cord is damaged, it can have long-term effects, from constant pain to paralysis. Neurons are mostly located in the spinal cord and brain, so damage to the spinal cord leaves damaged neurons.

The lab developed materials that contain different types of drugs. The material with the drugs can be placed on or near the damaged area of the spinal cord. The drugs inside help the body grow new neurons and heal itself. The lab also develops materials for brain electrodes to reduce swelling. When someone has a concussion, their brain has moved inside their skull and bumped up against the skull. This can cause swelling and, if untreated, brain damage. So it is very important to reduce swelling inside the brain and spine.

This experience confirmed Gianna's passion for the field. She loves knowing that her work can have a direct, positive impact on people.



One of the most meaningful experiences in Gianna's journey was working at a medical company that manufactured parts and products. Specifically, the company designed heart valve replacements.



This experience became especially personal when Gianna's grandfather needed heart valve surgery. As it turned out, the device used in her grandfather's operation was made by the company where she interned!

She had been involved in the manufacturing side, learning about the meticulous process and protocols that ensure these products are able to save lives. Seeing her work come full circle, by helping someone she loved, was a powerful reminder of why she went into biomedical engineering.

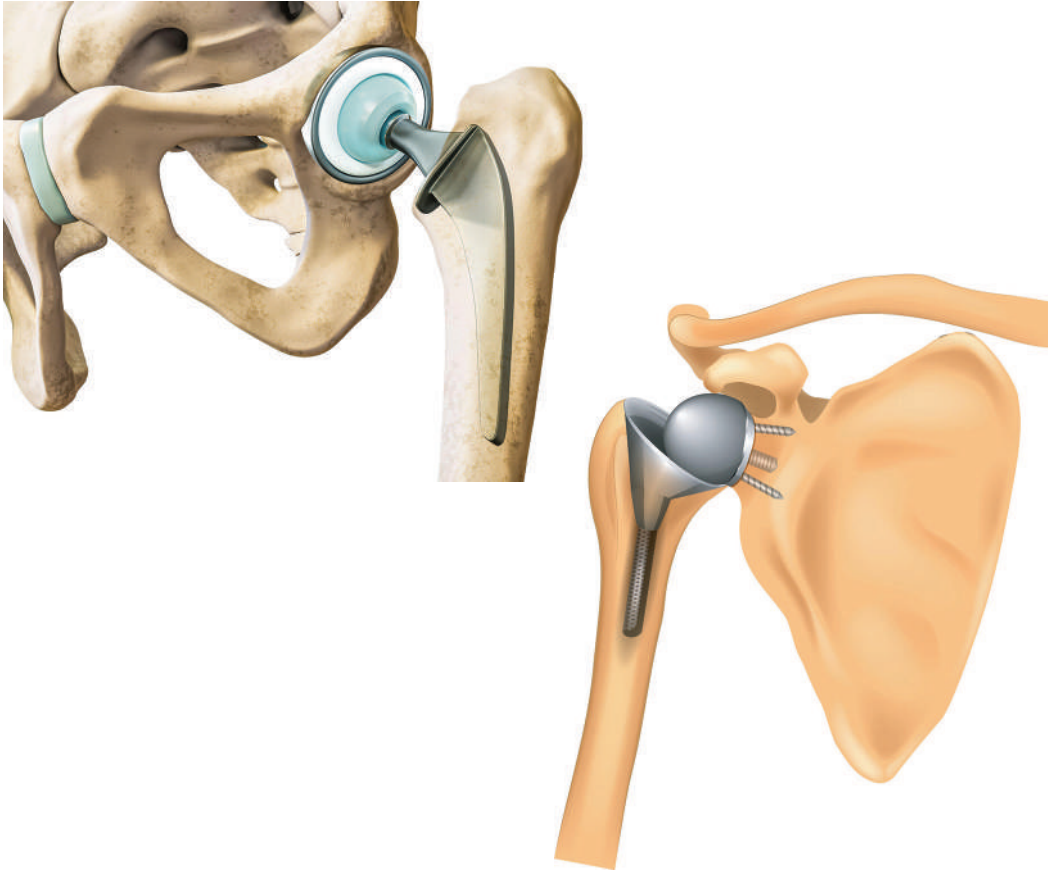
Throughout her time at RPI, Gianna has gained hands-on experience through internships in various areas of health care technology. Each offered her a chance to apply her engineering skills in real-world settings. One of her most impactful internships was with a company specializing in **robotic** knee replacement systems. During this experience, she worked on developing advanced algorithms designed to assist surgeons during knee replacement procedures. The **algorithm** she helped create was critical in guiding surgeons to accurately determine the placement of implants.



These systems enhanced the precision of surgeries. The robotic technology also reduced the time spent in the operating room, leading to less invasive surgeries and shorter recovery periods for patients. Gianna found it rewarding to be part of a project that directly improved patient care.



This project carried a personal significance for Gianna. Her own family had experienced the benefits of medical advancements. Her grandmother had both her hip and knee replaced. Her grandfather underwent shoulder replacement surgery. Seeing how these procedures improved their mobility and quality of life made Gianna realize just how vital her work could be.



The experience of working on robotic knee replacement systems brought her technical skills to the forefront. It also deepened her understanding of patient care. She realized engineering can address complex medical challenges in ways that truly make a difference. Gianna hopes that more families like hers can benefit from these advancements.



At RPI, Gianna has been active in STEM outreach as an Engineering Ambassador, inspiring younger students to explore science, technology, engineering, and mathematics. The Engineering Ambassador program is found in twenty colleges and has over two thousand members.

Gianna understands how important it is to introduce kids to these fields early, as she didn't discover engineering until high school. Until very recently, most high schools have not had engineering programs to introduce students to the concept of applying engineering to solve problems.

Through school visits and workshops, she shares her journey, showing how STEM can combine varied interests and lead to exciting careers. By sparking curiosity, she hopes to inspire the next generation of problem-solvers and innovators to follow their passions and explore new possibilities.

Gianna's family has benefited from medical advances, and she wants to pay that forward by becoming a biomedical engineer and by helping produce the next generation of engineers after her. Gianna's story is a testament to how passion, curiosity, and versatility can come together to form a career path and make a difference in the world.



Inspired by . . .

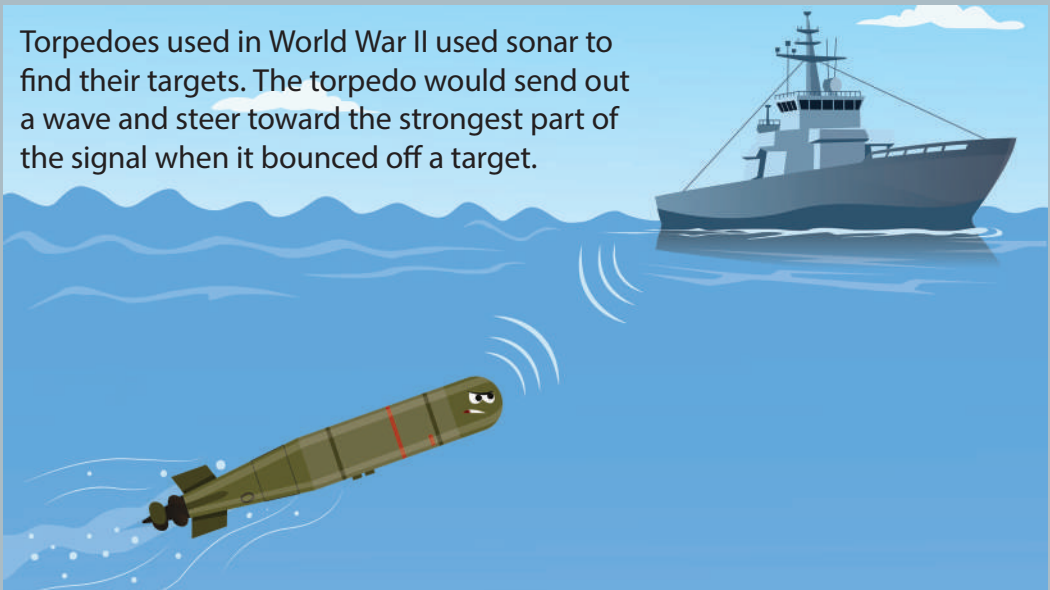
To be **inspired** by someone means they made us want to try something.



Hedy Lamarr

- Born in 1914 in Austria
- Jewish-American Hollywood actress
- Star during Hollywood's Golden Age in films such as *Samson and Delilah* (1949)
- Inducted into Hollywood's Walk of Fame in 1960
- Also, **groundbreaking inventor**! Her innovations have had a lasting impact on technology through Bluetooth and Wi-Fi.

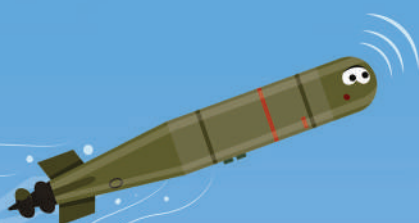
Torpedoes used in World War II used sonar to find their targets. The torpedo would send out a wave and steer toward the strongest part of the signal when it bounced off a target.



Gianna Scire was inspired by Hedy Lamarr, actress and inventor whose work helped form the basis for Bluetooth and Wi-Fi technology.

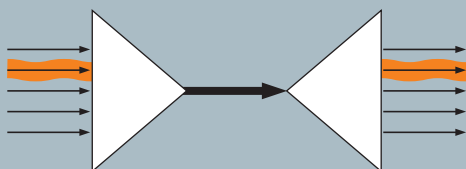


Hedy Lamarr, working with pianist George Antheil, proposed a way to have the frequency of the sonar change. Their system used eighty-eight possible frequencies, which is the same number of keys as on a piano.



By sending the same frequency signal from another area, the torpedo could be confused and misdirected. This would cause the torpedo to miss.

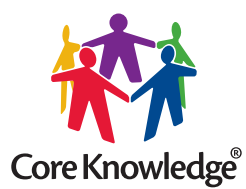
First, the signal would be hidden as part of a larger signal. This is known as *spread spectrum*.



Second, the signal would move in the spectrum. The signal would hop from one frequency to another to prevent jamming.

When you pair your phone to earbuds or a watch to your phone, or your laptop to a Wi-Fi network, you are using the technology Hedy Lamarr helped develop.

Who inspires you to find out more about the way things happen?
Who has helped you figure out how something works?



CKSci™
Core Knowledge **SCIENCE™**

Editorial Director
Daniel H. Franck

Subject Matter Expert

Martin Rosenberg, PhD

Teacher of Physics and Computer Science

SAR High School

Riverdale, New York

Illustration and Photo Credits

antonel adrian tudor / Alamy Stock Photo: 22c–d

benis arapovic / Alamy Stock Photo: 19b

Collins / Alamy Stock Photo: 15c

Diego Grandi / Alamy Stock Photo: 36b

dpa picture alliance / Alamy Stock Photo: 40a

felix mizioznikov / Alamy Stock Photo: 36c

Glasshouse Images / Alamy Stock Photo: 44c

Hayk Shalunts / Alamy Stock Photo: 44b

Hemis / Alamy Stock Photo: 15a

incamerastock / Alamy Stock Photo: 17

Jamie Pham / Alamy Stock Photo: 36a

JJ Gouin / Alamy Stock Photo: 21

Lander Loeckx / Alamy Stock Photo: 22b

LightField Studios Inc. / Alamy Stock Photo: 43

Marc Calleja / Alamy Stock Photo: 45d

Marsha Williamson Mohr / Alamy Stock Photo: 36d

MattLphotography / Alamy Stock Photo: 41a

Mineral Vision / Alamy Stock Photo: 23c

Peter van Evert / Alamy Stock Photo: 22e

Photology1971 / Alamy Stock Photo: 15b

Rick Decker / Alamy Stock Photo: 34b

SamULvisuals / Alamy Stock Photo: 14a

Science History Images / Alamy Stock Photo: 44a

Sergey Ryzhov / Alamy Stock Photo: 40b

Sueddeutsche Zeitung Photo / Alamy Stock Photo: Cover A, 22a

Traimak Ivan / Alamy Stock Photo: i, iii

Viktoriya Kabanova / Alamy Stock Vector: 41b

Wirestock, Inc. / Alamy Stock Photo: 39

Zbigniew Pożniak / Alamy Stock Photo: 35

Zoonar GmbH / Alamy Stock Photo: Cover B, 37

CKSci™

Core Knowledge SCIENCE™

A comprehensive program in science, integrating topics from Earth and Space, Life, and Physical Sciences with concepts specified in the **Core Knowledge Sequence** (content and skill guidelines for Grades K–8).

CK SCIENCE IN ACTION™

units in this series include:

Grade K: Kyle and Jamie

Grade 1: Daniela and Thaís

Grade 2: Laura and Sandra

Grade 3: Christian and Skylar

Grade 4: Pearl, Dan, and Ken

Grade 5: Rowan and Gianna

www.coreknowledge.org

Core Knowledge Curriculum Series™