ScienceNews Explores
OCTOBER 2025

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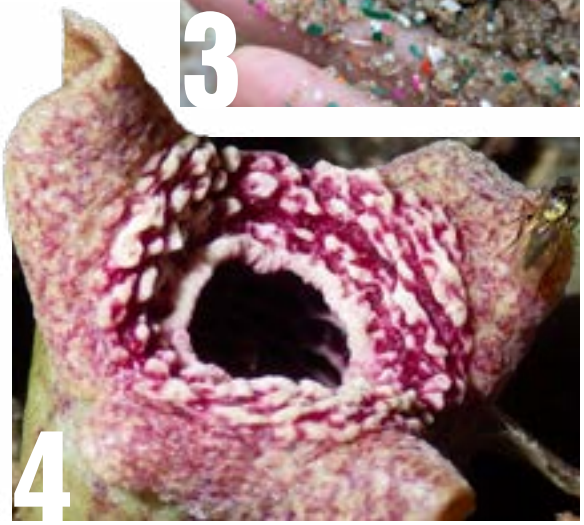
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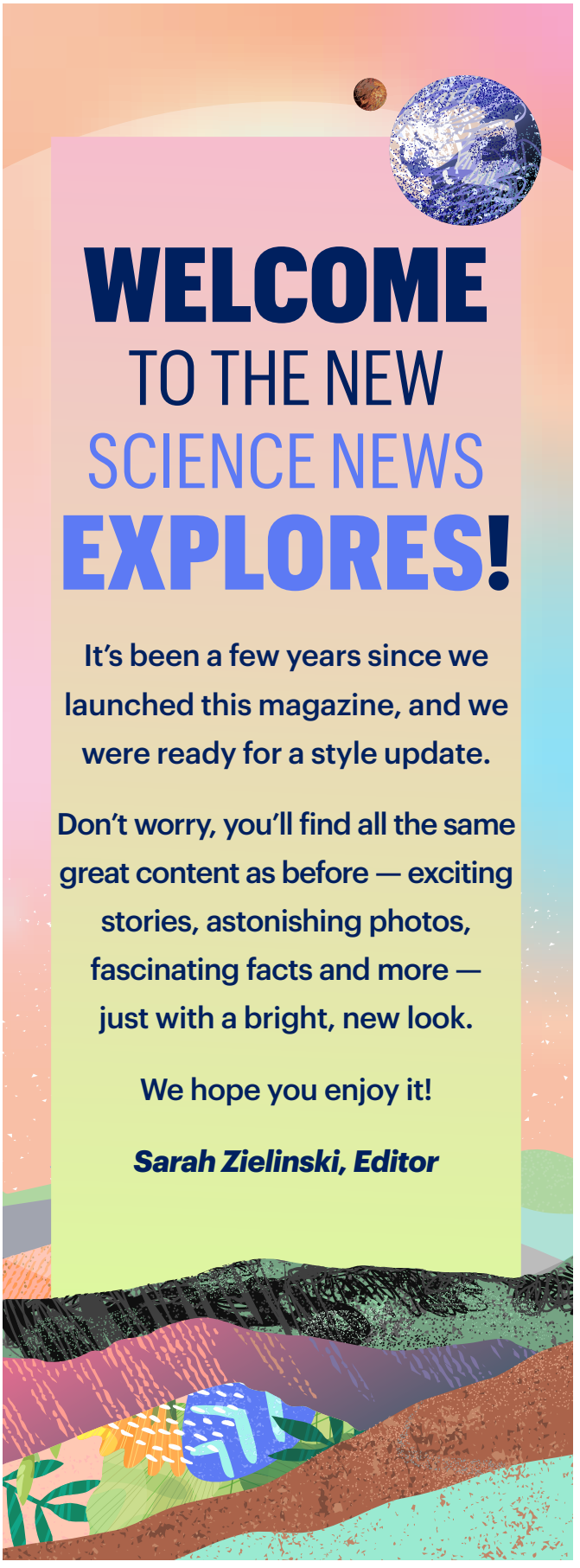

WELCOME TO THE NEW SCIENCE NEWS EXPLORES!

It's been a few years since we launched this magazine, and we were ready for a style update.

Don't worry, you'll find all the same great content as before — exciting stories, astonishing photos, fascinating facts and more — just with a bright, new look.

We hope you enjoy it!

Sarah Zielinski, Editor

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Science News Explores (USPS 25676, ISSN: 2831-9966) is published monthly except in January and July by Society for Science, Inc, 1776 Massachusetts Ave., Washington, DC 20036. Periodicals Postage Paid at Washington, DC, and additional mailing offices. POSTMASTER: Send address changes to Science News Explores, PO Box 292933, Ketting, OH 45429. Subscriptions cost $29.95 (international rate $54.95 includes extra shipping charges). Single copies are $7.99 plus $1.01 shipping and handling (or for international, $5.01 shipping and handling).

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Q What are microplastics?

— Kaleb

A These are tiny pieces of plastic up to 5 millimeters (0.2 inch) in size, about as big as a pencil eraser. But they can be much smaller, the size of a pencil dot or less. Microplastics come from plastic items, such as tires, polyester clothing and the beads in shower gels. These materials are made of long strings of polymers that don't break down easily and stick around for a long time in the environment. But while plastic molecules don't break down completely, plastic does easily break apart into smaller and smaller pieces, creating microplastics. Scientists have found microplastics across nature, including in our food, bodies and even brains. Researchers are still studying the effects of microplastics on our health and the environment. But they know that these substances can interfere with our immune systems and more.

Q Why do things pee when they get scared?

— Owen K.

A Researchers aren't entirely sure why animals pee when scared. But some suspect this fear response evolved because it's a useful way to distract predators when being attacked. It may happen through fear disrupting parts of the brain that help determine when to pee. In humans, the prefrontal cortex — the part of your brain that makes decisions — normally works with the brainstem to decide when you pee. The brainstem senses when your bladder is full. The prefrontal cortex helps you hold it until the right time to go. Terror, though, activates the limbic system. This network of brain structures causes the "fight-or-flight" response. It produces stress signals that can override commands from the prefrontal cortex. This can cause the brainstem to tell the bladder to empty, even in inappropriate situations.

Q If an astronaut throws a rock in space and it doesn't hit anything, how long would it take to stop?

— Holden K.

A "Essentially never," says Mallory Molina. This astrophysicist works at Vanderbilt University in Nashville, Tenn. Newton's first law of motion, they note, says that an object in motion will stay in motion unless acted upon by an outside force. If you throw a rock on Earth, the force of air resistance will slow it down. You can feel this air resistance for yourself as wind against your face when you run. But since there's no air in space, Molina says, "there's really nothing to stop [a rock] from keeping that momentum." Interestingly, Newton's third law of motion states that every action has an equal and opposite reaction. So throwing a rock in space wouldn't just send it careening through the cosmos forever, Molina says. "You would go in the opposite direction with the same amount of force that you threw it."

CHAYANUPHOL/SHUTTERSTOCK

Do you have a science question you want answered?
Reach out to us on Instagram (@SN.explores), or email us at explores@sciencenews.org.

FOOD

There's always room for dessert

In mice and humans, the same brain cells signal fullness and sugar cravings

After a big meal, most foods lose their appeal. But even when you feel stuffed, a sweet treat might hit the spot. Biology may explain this feeling, a new study suggests. The same brain cells that make you feel full also make you crave sugar.

Neuroscientist Marielle Minère led the research. She works at the Max Planck Institute for Metabolism Research in Cologne, Germany. Her team shared its findings in *Science*.

Minère first got curious about sugar cravings while working with mice. When the mice were full, she noticed, they wouldn't eat more of their normal food. But they would eat sugar — as do many people after a meal.

"That really made us want to know what drives that extra sugar intake," she recalls. So Minère's team designed an experiment with two groups of mice.

One group could eat food all night, whenever they wanted. The others spent a night without food. This group couldn't eat until the next morning. In the end, all mice in that group, too, were full.

In the morning, the researchers offered both groups of mice sugar. And all devoured it — even those that had just eaten. This confirmed that even when full, mice crave sugar.

Minère's team devised a way to explore which parts of the brain might explain this.

The researchers inserted special proteins into a few parts of the animals' brains. These proteins glow when brain cells are active. To detect that glow, the scientists implanted a light-recording device into each mouse's brain.

The scientists focused on a bundle of neurons called the POMC. It sits in the hypothalamus, a part of the brain that controls hunger. These cells are known to make mice — and people — feel full. The team wondered if the same cells might help drive sugar cravings.

When an animal eats, POMC neurons kick off a cascade of activity. They send messages to other groups of brain cells that give a sense of feeling full. That feeling tells the animal to stop eating.

When the mice were offered sugar, though, a different pathway out of the POMC lit up.

This pathway, Minère believes, acts as a sugar-craving circuit. It can override the fullness circuit. The sugar-craving circuit engages a part

Sugar seems to override the fullness circuit in our brains, engaging part of the brain that signals rewards and pleasure.

MARAZE/SHUTTERSTOCK

of the brain that signals rewards and pleasure. This, the researchers think, is what makes sweets so appealing — even when we're full.

Our brains differ quite a bit from mouse brains. Still, these particular parts of the brain are very similar in both species.

Minère's team looked at slices of human brain tissue. In both mice and people, POMC neurons follow the same paths, the researchers found. And brain imaging in volunteers show that those pathways in us respond to sugar, too.

To explain why our brains evolved to crave sugar even when we're full, Minère considers our ancient ancestors. When food is scarce, she says, sweet foods can provide lots of quick energy.

So, Minère says, it's not your fault if you can't resist the lure of a sweet treat. Blame biology.

— *Andrea Tamayo*

SPACE

More than 100 million

That's the number of objects that the Hubble Space Telescope has imaged since it was launched in 1990. This includes comets, galaxies, dying stars and planetary nebulae, like NGC 2899, shown here.

See how the Hubble Space Telescope is still revolutionizing astronomy at snexplores.org/Hubble

NASA, ESA, STSCI; IMAGE PROCESSING: JOSEPH DEPASQUALE (STSCI); © 2025 NATIONAL MUSEUM OF NATURE AND SCIENCE

PLANTS

Stinky plants reek of rotting flesh due to genetic trick

A DNA tweak gives several types of flowers the scent of death or dung

Some flowers attract pollinators by emanating the smell of death. Examples include plants in the *Symplocarpus* (left, *S. renifolius*), *Eurya* (top right, *E. japonica*) and *Asarum* (bottom right, *A. simile*) groups.

Not all plants attract pollinators by smelling sweet. To attract flies, some plants stink like rotting meat or even dung. The stench is chemically the same as the smell that comes from bacteria feasting on rotting corpses. How plants make these foul scents has been a mystery — until now.

Scientists in Japan looked at DNA in three unrelated groups of stinky plants. All had evolved the same trick to produce their stench: tweaking one gene. (Genes are bits of DNA related to certain traits.)

All the stinky plants turned out to have an extra copy of the gene *SBP1*. This gene makes an enzyme that helps break down methanethiol. This smelly molecule can build up in the mouths of people who don't regularly brush their teeth, causing bad breath.

In some plants, this extra copy of *SBP1* was changed, or mutated. The altered gene can make an enzyme with a few different amino acids in it.

With those tiny changes, the altered enzyme no longer breaks down methanethiol. Instead, it links two of these molecules into an even smellier chemical called dimethyl disulfide. That chemical reeks like rotten meat.

The plants may benefit from this foul-smelling molecule by attracting more pollinators.

Gene duplication — like what happened in these plants — is pretty common. It has happened in the evolution of most life forms, including humans.

Flawed extra copies of genes lead to new traits in many species. That's because copies of genes can mutate without harming the original. This lets species try out new traits without losing old ones.

— *Tina Hesman Saey*

EARTH

Earth farts may explain some spooky floating lights

Ignition of gases emitted by earthquakes may be behind some eerie events in South Carolina

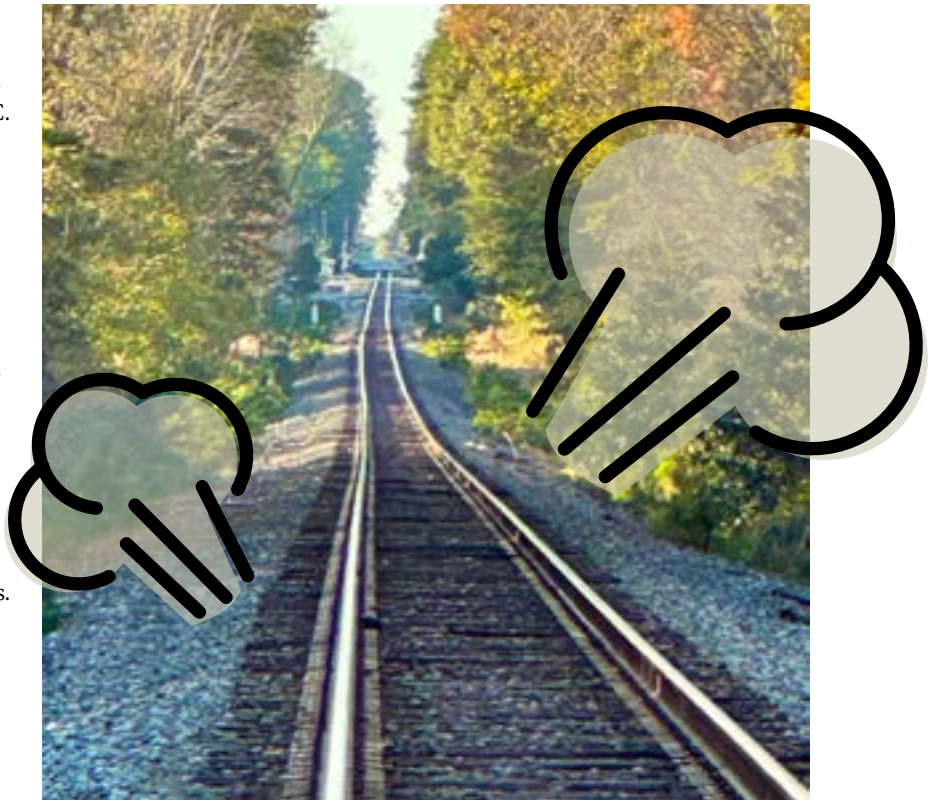
Since the 1950s, people have reported strange balls of light floating down a road along old railroad tracks near Summerville, S.C. These spooky shimmers are known as the Summerville Light. Local lore says a grieving ghost's lantern is behind the glow. Geologist Susan Hough now proposes a different explanation: earthquakes.

Hough works for the U.S. Geological Survey in Pasadena, Calif. Quakes can release gases, including radon and methane. Those vapors could ignite from static electricity or grinding rocks, she suggests.

Summerville sits far from any tectonic plate boundaries. As such, it might seem an unlikely spot for quakes. But in 1886, damage from a magnitude 7 quake killed 60 people in nearby Charleston. Hundreds of aftershocks shook the region in the decades that followed. That points to the area's continuing high seismic activity.

The region has plenty of ghost tales, too. The Legend of the Summerville Light may be the most gruesome. A railroad worker's wife was supposedly waiting for him by the tracks one night. There she got word he had been beheaded in an accident. Since then, the legend goes, she's returned with a lantern — even after her death — in search of her husband's head.

Hough scouted for a less spooky explanation of the phenomenon. She dug into books, magazines and online sources. She was looking for recorded sightings of the mysterious lights. Then she studied the area's earthquake history from 1890 to 1960. This time span included long before the sightings began.



A couple quakes had been reported over that time. There likely also would have been smaller undetected temblors, Hough says. And it's possible that these jolts might have caused the lights, she says.

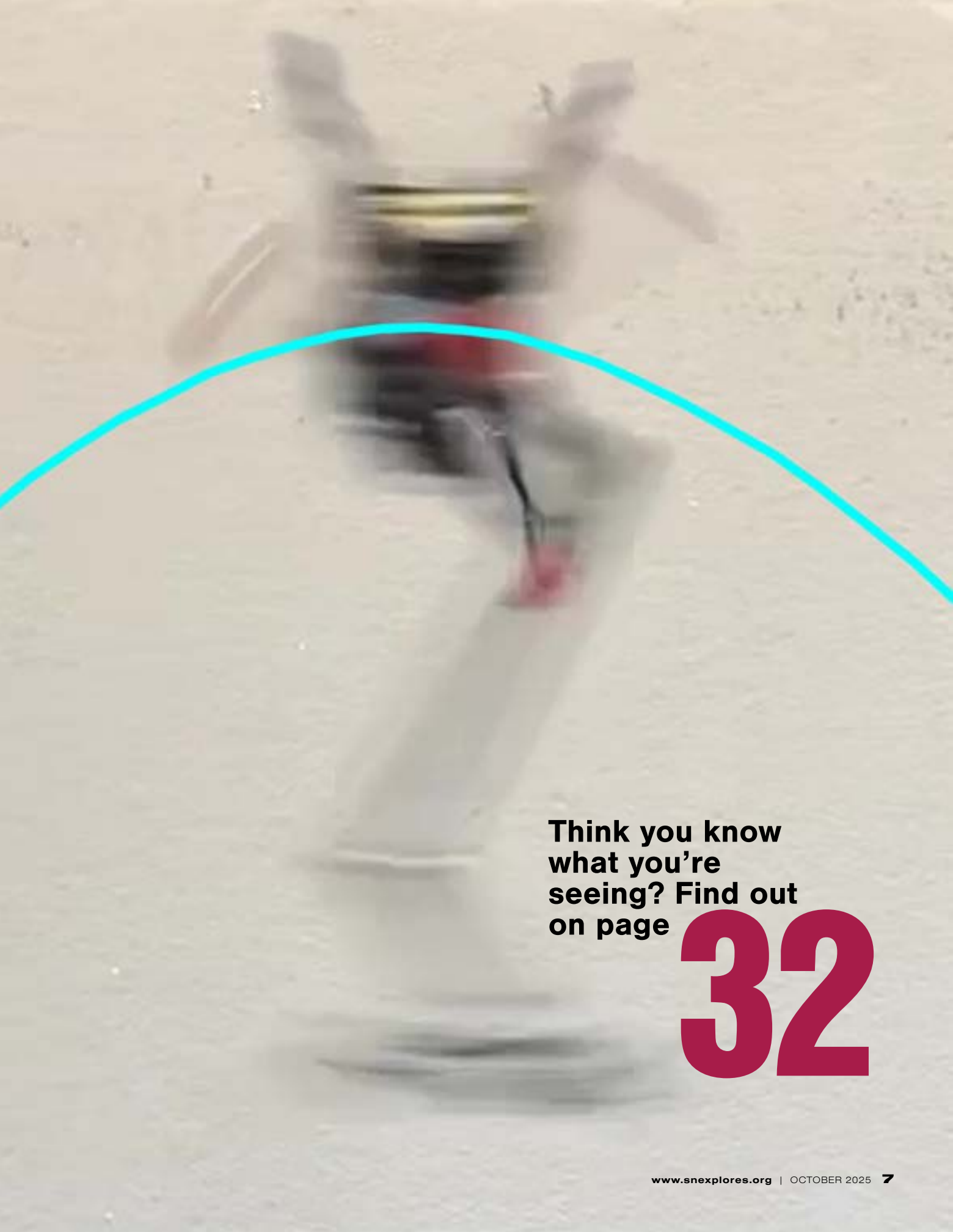
Hough also hunted down other local paranormal claims. She found reports of cars shaking and the moving of objects and doors. Some people even heard footsteps in upstairs rooms. Subtle quakes might explain all of these, she says. Hough published her findings in *Seismological Research Letters*.

Her proposal that the lights and other strange activity trace to quakes is reasonable, says Yuji Enomoto. He's an earthquake scientist at Shinshu University in Matsumoto, Japan. Still, he says, more geologic data are needed to confirm quakes as triggers for the Summerville Light.

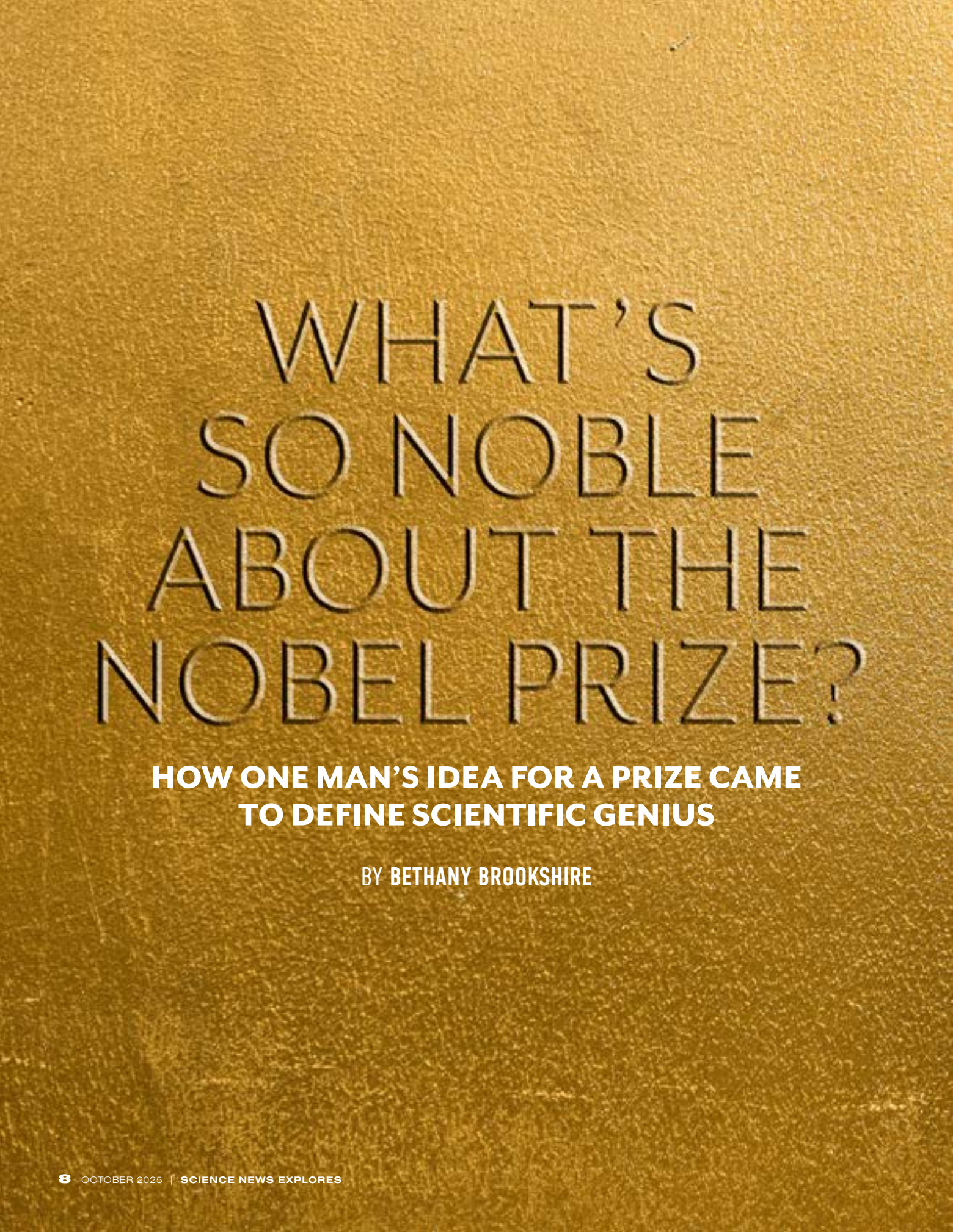
— *Nikk Ogasa*

An earthquake in 1886 may have caused the slight offset seen in this railroad track between Charleston, S.C., and nearby Summerville. Since then, ghostly lights have been reported floating above the track. A fault, thought to be some 500 meters (1,600 feet) underground, may have fueled these lights.

S. HOUGH



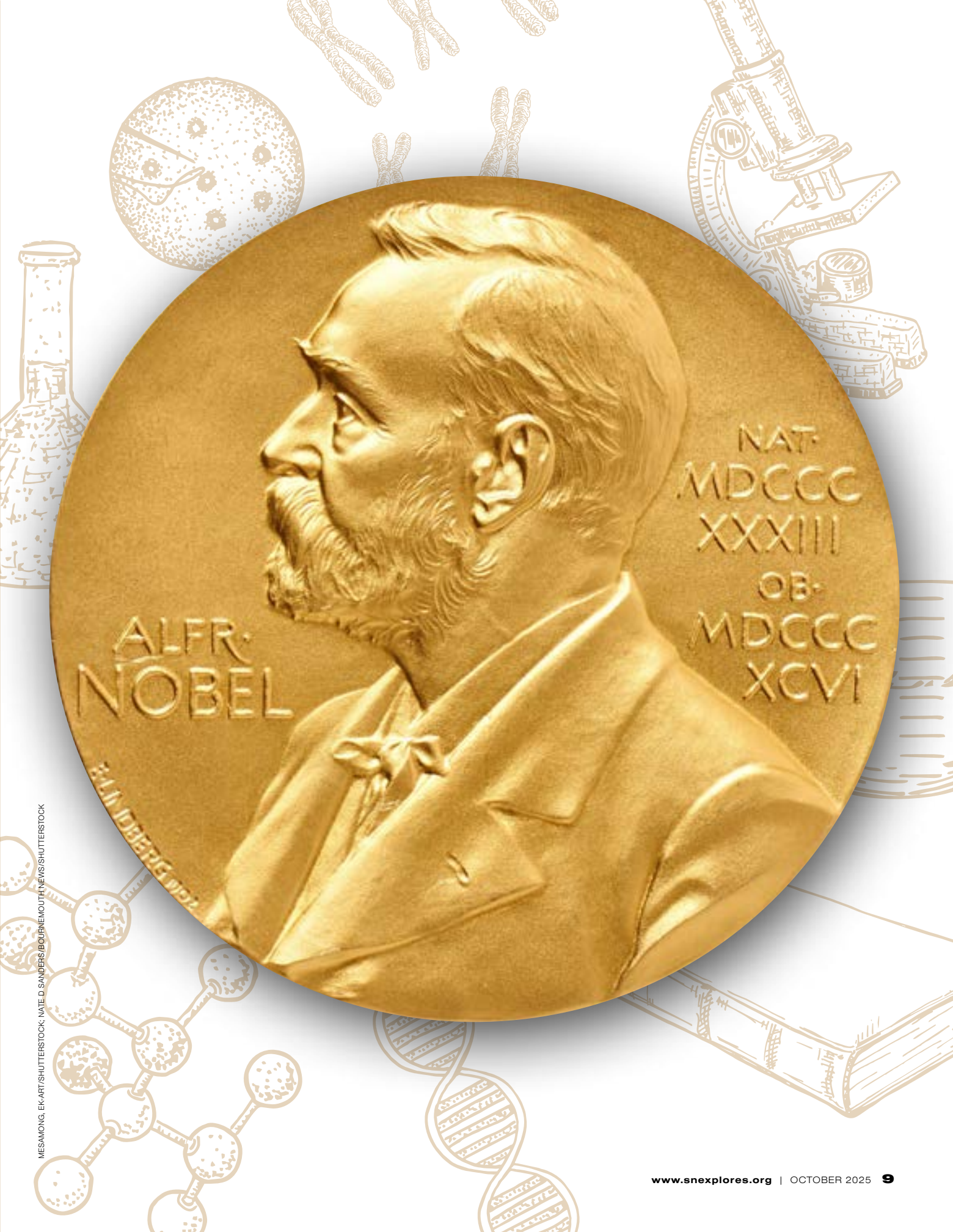
Think you know what you're seeing? Find out on page 32



WHAT'S SO NOBLE ABOUT THE NOBEL PRIZE?

HOW ONE MAN'S IDEA FOR A PRIZE CAME TO DEFINE SCIENTIFIC GENIUS

BY BETHANY BROOKSHIRE



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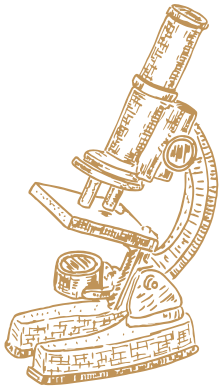


Katalin Karikó thought the call was a joke. It was 3 a.m. on October 2, 2023. Her husband answered the phone. He handed it over. "It is for you," he said. Only half awake, Karikó heard someone calling from Sweden to congratulate her: Karikó had won the Nobel Prize in Physiology or Medicine.

Karikó works at the University of Szeged in Hungary. She also works at the University of Pennsylvania in Philadelphia, where she had been asleep that day in October. A biochemist, she has spent much of her career studying messenger RNA. This molecule carries instructions from a cell's DNA so they can be translated into proteins.

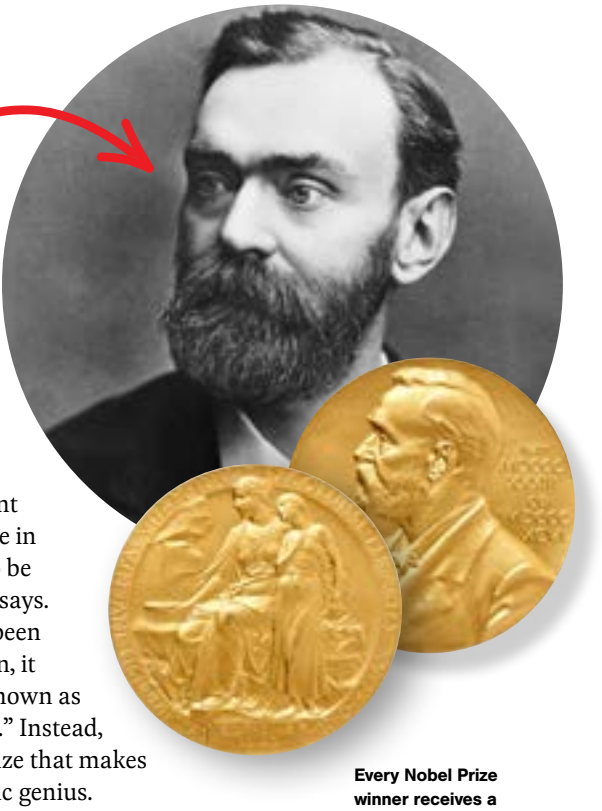
Karikó and her colleague Drew Weissman learned how to tweak that RNA. When the COVID-19 pandemic hit, her findings allowed other scientists to leap into action. In less than a year, they made a vaccine using mRNA. So thanks to Karikó, you may have gotten a vaccine to protect you from COVID-19.

This work definitely sounds worthy of a big prize. And the Nobel is the biggest science prize of them all. Winners receive a solid gold medal imprinted with the face of Alfred Nobel (more on him later). They also get a large cash prize (in 2024, 11 million Swedish kroner, or about U.S. $1 million) to split among as many as three scientists in each field. Karikó shared her prize with Weissman, also a biochemist at the University of Pennsylvania.

Every year, the Nobel Foundation awards prizes in physics, chemistry, physiology or medicine, literature and peace. Sweden's central bank also gives a prize in economics.

Katalin Karikó received her Nobel Prize at a ceremony in Stockholm, Sweden, on December 10, 2023. In this image from the event are several Nobel laureates (from left): Louis Brus and Alexei Ekimov (chemistry), Karikó and Drew Weissman (physiology or medicine) and Jon Fosse (literature).

Alfred Nobel invented hundreds of things, including processes for making synthetic rubber and artificial silk. But he was most famous for inventing dynamite, a reliable explosive.



Every Nobel Prize winner receives a gold medal. This medal, which has the face of Alfred Nobel on one side, was awarded to E. Donnall Thomas, who received a Nobel Prize in Physiology or Medicine in 1990 for the development of bone marrow transplantation to treat leukemia.

The Nobel Prize is more than a gold paperweight and a nice chunk of money, though. It's a sign that someone and their work are very important.

But Nobel Prizes spotlight only a narrow slice of science — and very few scientists. Many fields of science don't fit the prize categories. And only three people can share one prize, even though hundreds may have worked on a discovery. Most of those others end up unrecognized for their role in prize-winning work.

The Nobel Prizes also tend to honor people — mostly men — in wealthy countries.

Prizes can be important. They may inspire young scientists. The hubbub around these prizes tells the general public that science matters. But the scientists who choose the winners are human and bring their own values and biases. So which scientists get celebrated — and which don't — can be political and sometimes biased.

NOBLE NOBEL?

These prizes are named for Alfred Nobel, a Swedish chemist in the 1800s who invented dynamite. He designed the explosive to help build railroads more safely and to tunnel through rocks while mining. But dynamite also was soon used for war and violence. Over time, Nobel grew fabulously wealthy from dynamite and his other inventions.

Nobel had planned to leave his fortune to relatives. But in 1888, his brother, Ludvig, died. At the time, a newspaper in Paris, France, made a mistake. They printed an obituary for Alfred, not Ludvig. (An obituary is a news story at someone's death outlining their life and achievements.) This story was titled: "The merchant of death is dead." It pointed to how Nobel's inventions had killed many people in battle.

Nobel never told the public how he felt about reading his own death notice in the morning paper. But seven years after reading his premature obituary, Nobel decided his fortune would fund what has come to be called Nobel Prizes, chosen by Sweden, his home country.

Nobel probably didn't intend for the prize to become like the Olympics of science, says Marshall Lichtman, a physician and teacher. Lichtman, who works at the University of Rochester Medical Center in New York, wrote a 2017 article on Alfred Nobel and the Nobel Prize. "What he was hoping to do, I think, was to provide [winners] with a prize that would allow them to continue this exceptional work."

The Nobel Prizes quickly became famous. One reason: There weren't other big prizes like it. And these prizes would be open to everyone. "That meant that the very best people in the world were going to be recognized," Lichtman says.

If Nobel's plan had been to change his reputation, it worked. Now he isn't known as "the merchant of death." Instead, he's the founder of a prize that makes people think of scientific genius.

PICKING PRIZES

Choosing who wins Nobels takes almost a year. It's a huge honor to be involved, says Juleen Zierath. She's a physiologist at the Karolinska Institute in Stockholm, Sweden.

She's also part of the 50-person assembly that works with a smaller committee to choose who wins the Nobel Prize in Physiology or Medicine. Zierath was the first woman to chair a Nobel committee and remains in the assembly.

Every year, scientists around the world have from September to January to nominate candidates for the Physiology or Medicine prize to the Karolinska Institute. (Nominations for other prizes are handled by different institutions.)

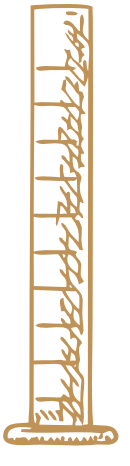
Only invited people can submit those nominations. These are very accomplished scientists and previous prize winners. They cannot nominate themselves.

Then a smaller committee gets to work narrowing down the list from hundreds of nominations.

"We are only allowed to award a discovery," not a person, Zierath explains. "So we have to sort through who's been nominated." Once the committee has made a short list of especially good candidates, they send it to the assembly.

The final vote for the Physiology or Medicine prize takes place on the first Monday of every October. (Other prizes get voted on later in the week.) It starts at 9 a.m. in Sweden. The voting is kept a tight secret. No one can bring a phone or laptop.

In another room, journalists from all over the world wait to hear the results. But first, each winner gets a call.



EK-ART/SHUTTERSTOCK; JONATHAN NACKSTRAND/CONTRIBUTOR/GETTY IMAGES; NATE D SANDERS/BOURNEMOUTH NEWS/SHUTTERSTOCK; THE NOBEL FOUNDATION ARCHIVE

Victor Ambros (left) was awarded the 2024 Nobel Prize in Physiology or Medicine. His wife, Rosalind Lee (right), manages Ambros' lab and contributed to the science for which he won the prize. But she was not included in his prize.

BOSTON GLOBE/CONTRIBUTOR/GETTY IMAGES; SIMON & SCHUSTER

A LIFE-CHANGING CALL

The time difference between Sweden and the United States is big. So mid-morning decisions in Stockholm result in middle-of-the-night phone calls to U.S. winners. And that call will be just the start.

Soon after Karikó received her call in 2023, the three phones in her house began ringing nonstop. By 7 a.m., journalists were knocking on her door. When Karikó answered, she got her picture taken still wearing her pajamas.

Winning a Nobel Prize means your life will never be the same, says Victor Ambros. He works at the University of Massachusetts Chan Medical School in Worchester. A developmental biologist, he studies how organisms grow. He took home a Nobel Prize in Physiology or Medicine in 2024 for discovering microRNAs. These tiny bits of genetic material help control how cells make proteins.

Nobel's goal with his prize was to help support scientists with the prize money — to let them keep doing their work. Ironically, Ambros has less time than ever to do research.

"Before this, I was working in the lab and doing experiments," he says. "I have not been able to get back to that." He is constantly traveling to give talks. Everyone wants to meet a Nobel Prize winner and hear what they have to say. When something changes in the world of science, journalists want to know what Ambros thinks.

In a way, the Nobel Prize is famous just because it's famous. "If you look at the media attention, there is no other prize worldwide that can compete with [it]," says Nils Hansson. He's a science historian who studies the Nobel Prize at Heinrich-Heine University in Dusseldorf, Germany. Journalists tell him that they don't generally cover other science prizes.

THE POWER OF A PRIZE

Most scientists — even very successful ones — will never win a Nobel. Those who do tend to look a certain way. Most are men and tend to be white. They're also usually from wealthy places like the United States or Europe.

In 2023, Karikó became one of only 13 women to have received the Nobel Prize in Physiology or Medicine. Even fewer have won in chemistry or physics.

The assemblies work hard to avoid bias, says Zierath. But most of these awards in science still go to people from the United States or Europe. That's largely because these regions have long invested in funding science and encouraging people to become scientists, Zierath notes. However, bias — preferring one type of person or country or discovery over another — can creep into decision-making. The assembly knows this. "One way to try to deal with biases is to identify that you have them," she says.

To be seen as prizeworthy, scientists have to make big discoveries. Often, this means working in big labs

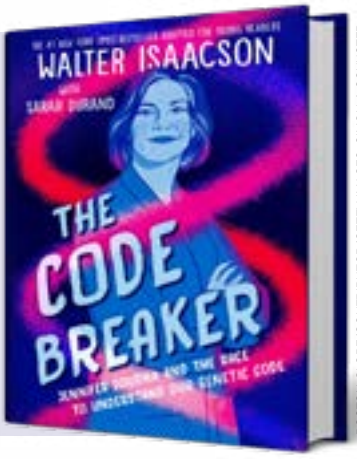
READ MORE

The Code Breaker:

Jennifer Doudna and the Race to Understand Our Genetic Code (Young Readers Edition)

By Walter Isaacson
Adapted by Sarah Durand

For her breakthrough contributions to the study of genetics, Jennifer Doudna won the Nobel Prize in Chemistry in 2020, joining the small group of women who have won Nobel science awards. Learn more about her life and research with this book.



BOSTON GLOBE/CONTRIBUTOR/GETTY IMAGES; SIMON & SCHUSTER

at important universities. This can be hard to do if someone comes from a low-income area or country, is a member of a minority or faces other challenges.

People of color or white women face a lot of barriers to succeeding in science, notes Harriet Zuckerman. She's a sociologist — someone who studies how people behave together — at Columbia University in New York City. There's an "array of obstacles that line the course of women's careers," she says. These "make it less likely" for them to reach a place where they can do the type of work likely to win a prize.

And of course, of the impressive scientists considered, only three people can win for any discovery. Those scientists are most often the heads of their labs. Others who work in the labs may go unrecognized.

Ambros, for example, won the 2024 Nobel Prize with collaborator Gary Ruvkun. Ruvkun is a geneticist at Harvard Medical School in Cambridge, Mass. But Ambros' wife, Rosalind Lee, is a scientist, too. She manages Ambros' lab and contributed just as much to the work. She, however, did not share the Nobel Prize with him.

"Here's a life partner, [my] partner at home, [my] partner in the lab, [my] science partner," Ambros says. "It would have been ... terrific, right, if we could have shared" the prize.

Many fields of science don't have a Nobel Prize, notes Robert Marc Friedman, a historian of science at the University of Oslo in Norway. "Where does ecology fit in?" Or the study of oceans? Weather and climate? Geology? Discoveries in these fields can be just as important as those in physics, chemistry or medicine. But most won't qualify for a Nobel Prize.

People also shouldn't make the mistake that Nobel Prize winners are geniuses, Friedman says. Doing great work in physics, for example, doesn't mean a scientist may know anything about politics or medicine. In fact, it may only mean they know a lot about one area of physics.

Still, Lichtman thinks that the Nobel Prize is important. It shines a light on science as a whole. "The average person doesn't sit at home and say, 'Boy, I hope there are a lot of good people going into chemistry or going into physics,'" he says. The Nobel Prize shows the world that science can change our lives.

Ambros agrees — and not just because he won one. "It's all about science and celebrating science," he notes. "I've talked more about my research publicly in the last couple of months than I did in my whole previous career." When people have heard he won the Nobel Prize, they don't only get curious about him and his work — they get curious about science.

EK-ART, EVERETT COLLECTION/SHUTTERSTOCK

WOMEN AND THE NOBEL PRIZES

When **Katalin Karikó** won her Nobel Prize in Physiology or Medicine, she joined the small group of women who have attained a Nobel Prize in a scientific field. Since the first prizes were awarded in 1901, 25 women have been awarded one of these prizes. Polish-French scientist **Marie Curie** is the only woman to have won two Nobel Prizes: **Physics in 1903 and Chemistry in 1911**. (All statistics below are from 1901 to 2024.)

Nobel Prizes ran in the Curie family. Marie Curie (seen here) shared her first Nobel Prize with her husband Pierre. Their daughter Irène Joliot-Curie received the 1935 Nobel Prize in Chemistry.

NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE

Number of PRIZES awarded 115

Number of LAUREATES awarded 229

NUMBER OF WOMEN LAUREATES 13

NOBEL PRIZE IN PHYSICS

Number of PRIZES awarded 118

Number of LAUREATES awarded 227

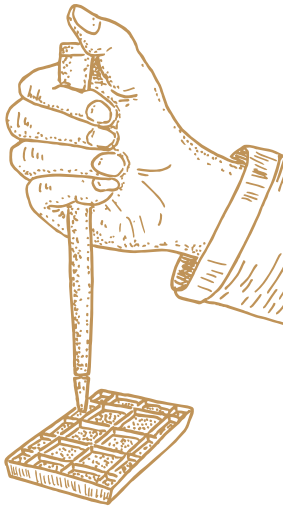
NUMBER OF WOMEN LAUREATES 5

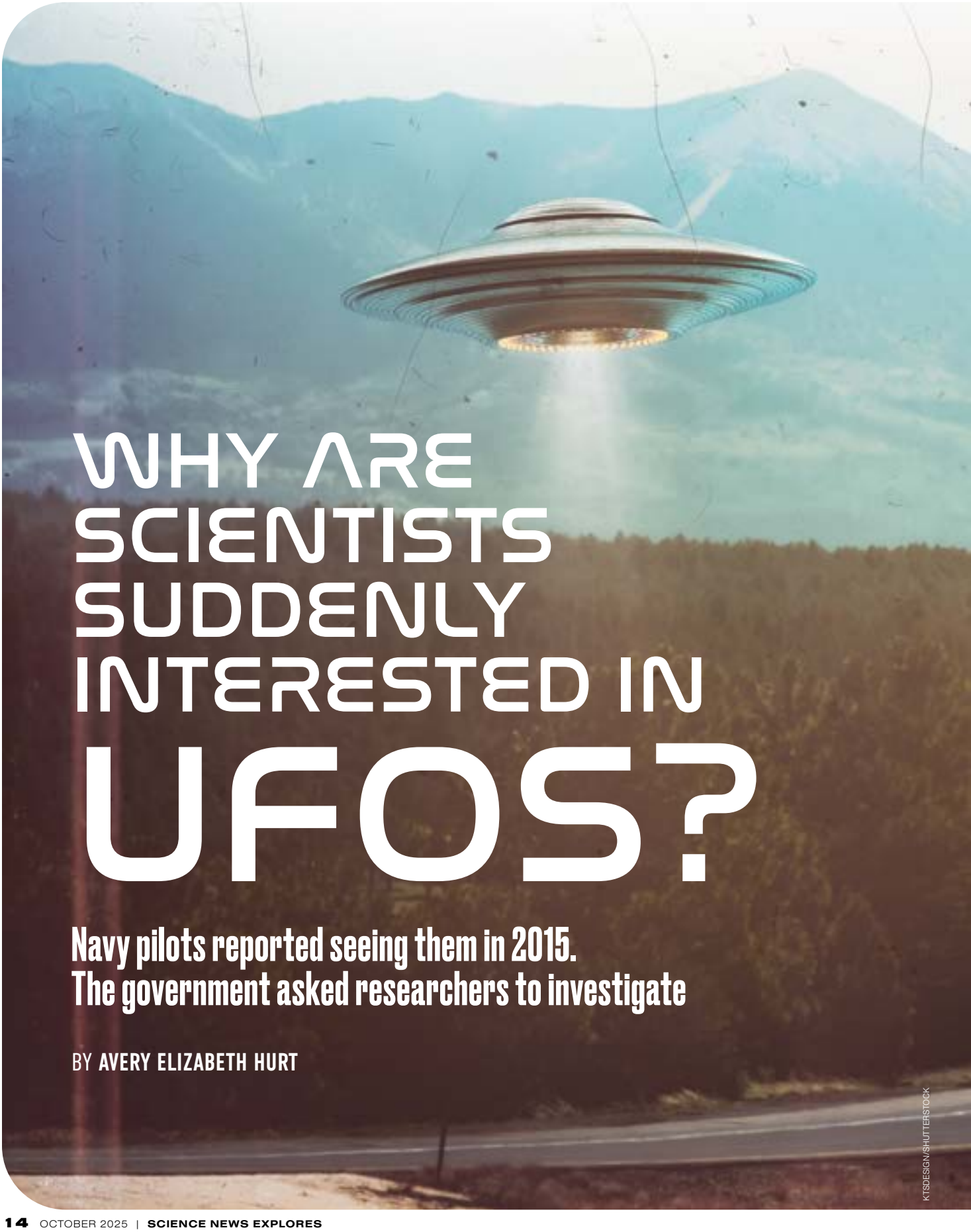
NOBEL PRIZE IN CHEMISTRY

Number of PRIZES awarded 116

Number of LAUREATES awarded 197

NUMBER OF WOMEN LAUREATES 8





WHY ARE SCIENTISTS SUDDENLY INTERESTED IN UFOS?

Navy pilots reported seeing them in 2015. The government asked researchers to investigate

BY **AVERY ELIZABETH HURT**

KTSDESIGN/SHUTTERSTOCK

In 2015, U.S. Navy pilots were flying training missions off the U.S. East Coast when they spied an oval-shaped object appearing to skim across the top of the water. It moved at incredibly high speed and seemed to be rotating as it flew. Soon, the pilots realized there seemed to be many of them. They started commenting to each other about what they were seeing.

"There's a whole fleet of them."

"My gosh."

"Look at that thing, dude!"

"Wow. What is that, man? Look at it flying!"

Pilots had seen similar objects almost daily for months. These didn't look like typical aircraft. They had no visible engines. They didn't seem to give off exhaust. Some skimmed the sea. Others appeared more than 9 kilometers (30,000 feet) in the air and moved at supersonic speeds.

Hardly quacks or UFO fanatics, these were highly trained pilots. And they weren't newbies, either. One who reported the sightings was Lt. Ryan Graves, an F/A-18 Super Hornet pilot. He had been in the Navy for 10 years. He and the others knew what normal aircraft looked like. They also knew how to keep their cool under pressure.

The public only became aware of their sightings four years later. That's when *The New York Times* published an article about them. The online article included leaked video recorded by cameras on the Navy planes. In April 2020, the U.S. Navy confirmed those videos were real — and then officially released them.

In recent years, other credible sources have also reported seeing UFOs — unidentified flying objects. Such objects are now called Unexplained Anomalous Phenomena, or UAP. But whatever you call them, the U.S. government has begun taking these mystery objects seriously. And it's recruited a lot of scientists to quietly investigate what's behind them.

We still don't know what the pilots and others have seen. But here's what's motivated the new and growing scientific interest in them.

THE SUMMER OF UFOS

In June 1947, W.W. "Mac" Brazel found some strange debris on his ranch on the outskirts of Roswell, N.M. He thought the debris might have come from a kite. However, he couldn't reassemble the bits of rubber, tinfoil, paper and wood strips into anything that looked like a kite.

Brazel told the local sheriff what he'd found. The ranch was near Roswell Army Air Field (RAAF), a military base. So the sheriff reported this to the Army.

Officers from RAAF went to the ranch. They couldn't identify the wreckage, either. The next day, the Army base issued a press release saying that the military had found remnants of a flying saucer.

The local newspaper ran the headline: "RAAF Captures Flying Saucer on Ranch in Roswell Region." Later, the Army changed its story. They said the debris came from a weather balloon. But it was too late. UFO fever had gripped the nation.

And since then, it's never let go.

THE GOVERNMENT COMES CLEAN

UFOs are real. There's no question about that.

The term simply means some witnessed object is unknown and moving through the air. If you see something in the sky that you can't identify, then, by definition, it's a UFO. But when people ask if UFOs are real, what they usually mean is: "Are we being visited by aliens?"

Science certainly has no answers yet for that.

After Roswell, people started reporting lots of UFOs. Some witnesses made wild claims they couldn't back up. Some said they'd encountered an alien. Others even claimed to have been abducted by aliens. But there was never any physical evidence to support such statements.

Soon conspiracy theories started circulating. People said they'd heard an alien spaceship had crashed in Roswell. They shared rumors that the government had stashed away bodies of aliens who'd died in the crash. Later, some rumors said, those bodies were taken to a secret installation in Nevada known as Area 51.

These stories were ridiculous. But still they spread.

In the photo above, from July 1947, Major Jesse Marcel inspects debris recently found on Mac Brazel's ranch. The Army put out a press release saying that the military had found the remains of a flying saucer — only to retract the story the next day.

ROSWELL DAILY RECORD'S ROSWELL INCIDENT

The day after this headline ran, the Army said that it was a weather balloon, not a flying saucer, that landed in Roswell, N.M. But UFO fever had already gripped the nation.

The U.S. government didn't help much. It had secrets of its own. Eventually, the government admitted it had been hiding something — it just wasn't little green men. A 1994 Air Force report tried to put the hidden-aliens story to rest. It said the debris that landed on the Brazel ranch had not been a weather balloon after all. It was part of Project Mogul — a secret program to develop balloons that could identify and track Soviet missile launches. (This was during the Cold War. At that time, the United States and the Soviet Union were stockpiling nuclear weapons in case of another world war.)

The Air Force also explained away the alien "bodies" that people thought they had seen. These were crash-test dummies used to test ejection seats in experimental aircraft.

Coming clean about Roswell didn't end the conspiracy theories, though. Wild tales continued. For years the government didn't say much more about UFOs. But when the story about the 2015 Navy pilot sightings broke, the government began to talk more openly about UFOs.

HEARINGS AND REPORTS

In 2021, the government released a brief report. It had turned up no evidence of aliens. It did admit, however, that many UAP sightings have been recorded since 2004. And they remain unexplained.

That doesn't mean these were craft built or piloted by aliens, of course. There are probably several explanations, the report said. Birds. Trash, such as escaped party balloons. Secret military projects. New technology developed by other countries.

That last one is what concerned many members of Congress and the military.

In May 2022, Congress held a public hearing on UFOs. High-ranking officials from the military testified. They said 400 more unexplained sightings had been reported since the 2021 report. Still, nothing pointed to aliens.

Scott Bray testified at the hearing. Deputy director of Naval intelligence at the time, he explained why the government wasn't saying much about these sightings: "We do not want potential [military enemies] to know exactly what we are able to see." (Bray now works in intelligence for NATO, an international military alliance.)

Then, in July 2022, the Pentagon created AARO. That stands for All-domain Anomaly Resolution Office. Its job is to investigate UAP. The government started calling UFOs this in an attempt

The U.S. government keeps an archive of records related to UAP. This "flying saucer" was spotted on June 4, 1964.

GODDARD SPACE FLIGHT CENTER/NATIONAL ARCHIVES

to remove some of the stigma associated with studying these objects.

The military now wants to know if UAP are a threat. Science will settle for a simpler answer: What are they?

SCIENTISTS STEP UP

There's reason to think we probably aren't alone in the universe. Earth is 4.5 billion years old. The earliest life on Earth is 3.5 billion or maybe 4 billion years old, explains Seth Shostak. This astrophysicist is senior astronomer at the SETI Institute in Mountain View, Calif. (SETI stands for Search for Extraterrestrial Intelligence.)

Life on Earth emerged fairly quickly. This suggests, Shostak says, that it wasn't hard for life to begin. If it quickly started on Earth, life probably could have started in many other places throughout the cosmos, too.

There are a trillion planets in the Milky Way alone. There may be more than a trillion habitable planets in the entire universe, Shostak says. "So yeah," he adds, "there's plenty of opportunity for life." But that still doesn't mean that aliens have been visiting Earth.

Julia DeMarines is an astrobiologist. She studies how life might evolve on other planets. DeMarines works at the University of California, Berkeley and is a former SETI observer. SETI researchers look for signs of life elsewhere in the universe. They don't study UFOs. Few scientists do.

Until recently, DeMarines says, most scientists described the study of UFOs as pseudoscience. No surprise, then, that scientists who are interested in UAP have seldom talked about it. They didn't want other scientists to think they're kooks.

But that's changing. In June 2022, NASA assembled a team of scientific experts. Their mission: Figure out how NASA can help study UAP.

The team made some specific recommendations. For instance, it said NASA should use its enormous body of space data for this study of UAP. And it should work with other government agencies to investigate reported sightings. The team also emphasized that all UAP studies must stay focused on evidence and data.

Avi Loeb agreed, and he wanted to help. Loeb is an astrophysicist at Harvard University in Cambridge, Mass. "To study those things," he argues, "is the duty of scientists."

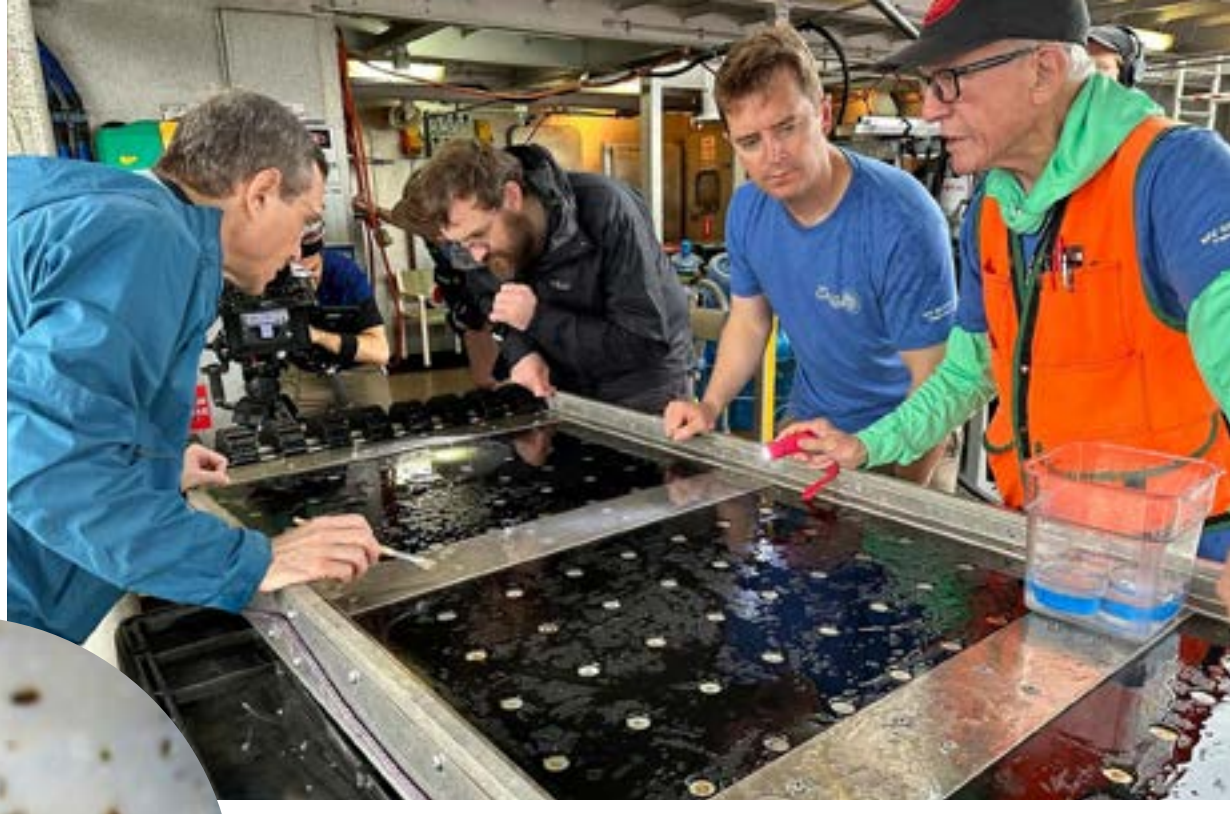
In 2021, Loeb started the Galileo Project to scientifically investigate UAP. The project scans the skies with telescopes in an observatory at Harvard. "We basically take a movie of the sky," explains Loeb. Then artificial intelligence helps analyze the data. Two more observatories are in the works. Loeb hopes to have 10 eventually.

This is different from what AARO is doing, says Loeb. "Their job is to protect national security. I'm trying to figure out the world."

Avi Loeb (left) holds some debris recovered from the seafloor near Papua New Guinea. Loeb began the Galileo Project, which used a magnetic sled to recover these remnants from a mystery object that fell into the Pacific Ocean in 2014. Project members (right) viewed some of the bits after they were retrieved.

This comic strip from the 1950s shows how much UFOs influenced popular culture.

NAID: 595553/U.S. NATIONAL ARCHIVES; GALILEO PROJECT, LED BY PROFESSOR AVI LOEB (HARVARD)



These spheres, retrieved by the Galileo Project, may be from a mystery space object that fell into the Pacific. Scientists still don't know what they are or where they're from.

GALILEO PROJECT, LED BY PROFESSOR AVI LOEB (HARVARD)

Loeb and his team are not the only ones. NASA's involvement changed things, says Greg Eghigian. He's a historian at Penn State University in University Park. He wrote the book *After the Flying Saucers Came: A Global History of the UFO Phenomenon.* NASA's involvement was a signal to scientists that talking openly about UAP is OK, Eghigian says. It allowed scientists to discuss ideas that had been taboo.

MORE MYSTERIES

Now that science is on the job, what can we expect to learn about UAP and maybe even alien life? One possibility is that science may be able to explain the previously unexplained.

DeMarines says UAP could be due to some unusual weather conditions. For example, spacecraft launched from Earth around sunset can create weird effects. When the sun is setting, she explains, gases expelled by the spacecraft will reflect only that light reaching the upper atmosphere. What's more, she adds, "They stay reflective for a long time. So it looks unexplainable."

Or UAP could be an effect caused by light bouncing off communications satellites, Loeb says. Of course, it also could be technology not from another planet, but from another country on this one.

But what about aliens? Could UAP really be alien spaceships?

Garrett Graff is a historian and author. He wrote the 2024 book *UFO: The Inside Story of the US Government's Search for Alien Life Here — and Out There.* While doing research for it, he noticed something people often get wrong when they think about aliens and UAP. "We expect first contact with alien life to be like it is in movies, like *Independence Day* or *Contact*," he says. But in real life, he notes, it might not be that obvious.

Our first encounter with aliens, Graff says, might not be meeting them. It might be finding remnants of their tech.

For example, we might find a piece of space trash that doesn't come from our world. We'll know it didn't originate on Earth, but we won't know where it did come from.

One reason we may not see the aliens themselves is that they may no longer exist. DeMarines points out that our civilization has been technologically advanced for little more than 100 years. The universe, meanwhile, is almost 14 billion years old. Her point is that the timing might not overlap. There may have been many other civilizations like ours. And there may be many more to come. But the chances that ours and theirs occur at the same time aren't terribly good, she says.

Shostak, however, thinks it won't be long until we find alien life, or at least evidence that it's out there somewhere. "There have been 10,000 generations of *Homo sapiens*," he says. "The people reading this article are probably members of the first one in which we learn that there's life in outer space."

This astronomer searches for alien chemistry and tech

Chenoa Tremblay uses radio telescopes to look for extraterrestrial civilizations

One of the main ways that scientists look for extraterrestrial life is by detecting radio waves. When people hear this, they often think it involves snooping on aliens, says Chenoa Tremblay. "That's not what we're doing. We're not trying to eavesdrop or invade anybody's privacy." Instead, Tremblay uses radio telescopes to study molecules in the gas layers around stars. A radio astronomer, she works for the SETI Institute in Mountain View, Calif.

Tremblay relies on a technique called spectroscopy. When different molecules interact with energy from nearby stars, the molecules absorb and re-emit that energy in specific frequencies. "Every molecule has its own fingerprint," she says. Some, such as water and methane, act as biosignatures. These are signs that life may be producing these molecules on exoplanets.

Tremblay uses the Karl G. Jansky Very Large Array telescope in New Mexico to pick up these signals. "We [then] use computers to translate that information into images using complex mathematics," she says. That lets her team "study the universe in a way that we can't use our eyes to do." In this interview, Tremblay shares her experiences with *Science News Explores*. (This interview has been edited for content and readability.)
— *Aaron Tremper*

Q What inspired you to pursue your career?

A I grew up in a small town of about 600 people in New Hampshire. I was a naturally very curious child. Throughout high school, I tried exploring subjects I liked. In general, learning was hard for me most of the time. But math was always fairly easy for me, and I enjoyed chemistry, which I studied in college.

After earning my bachelor's degree, I worked at various companies doing research for about 25 years. That's where I realized that I didn't have to just study the chemistry of things here on Earth. I could study the chemistry of the universe.

Q How did you get to where you are today?

A I started volunteering for university projects to learn from mentors. That helped me figure out how to become a radio astronomer. In 2016, I got into a doctoral program for physics and astronomy. In high school and my first years in college, I really struggled with physics. So it's really funny that I ended up with a Ph.D. in the subject.

During my program, I was using a brand-new radio telescope in Western Australia. We used a set of wavelength ranges that we hadn't used before. We found some molecules that are super important to the early stages of life. But these popped up in environments that wouldn't necessarily indicate life, like around a newborn star. That suggested that these molecules do exist and could be available for life to develop elsewhere.

Q What piece of advice do you wish you'd been given when you were younger?

A The career you decide on now doesn't have to be what you do later. You can change your mind and switch paths. My parents' generation expected that you stay at the same job until you retire. There wasn't this understanding that you could switch careers if you were unhappy.

You also don't have to know what you want to do from a young age. My siblings knew since they were little what exactly they wanted to do. I sometimes feel like I'm still not 100 percent sure what I want to do. And that's OK, too. You can explore what you find interesting about the world.

HERE/SHUTTERSTOCK; C.D. TREMBLAY; ROBERT HOLLOW

Radio telescopes, like the Murchison Widefield Array, detect radio waves through antennae tuned to specific frequencies.

Chenoa Tremblay uses radio telescopes to look for biosignatures in the gas layers surrounding stars. These molecules, which include methane and water, may indicate that life exists on planets outside our solar system. Tremblay's team is also searching for technosignatures — molecules, such as nitrous oxide, and energy signatures given off by extraterrestrial technology.

MATH

M&M geometry

In this project, M&M stands for measurements and models!

By Science Buddies

Because most real-world objects are not perfect shapes, simple geometric formulas cannot exactly describe them. Still, formulas can be used to estimate the properties of irregular objects. This is called making a *geometric model*. Here, we'll test three different formulas — for a sphere, a cylinder and an ellipsoid — to see which one makes the best geometric model of an M&M.

OBJECTIVE

Investigate which formula best estimates the volume of an M&M

EXPERIMENTAL PROCEDURE

1. Measure the actual volume of an M&M using a water displacement test.

2. Line up 10 fresh M&M'S on their flat sides, end to end.

3. Measure the length of the row and divide the answer by 10 to find the long diameter of a single M&M. Divide that answer by two to find the long radius of a single M&M.

4. Line up the 10 M&M'S on their short sides, end to end.

5. Repeat Step 3 to find the short diameter of a single M&M. Divide that answer by two to find the short radius.

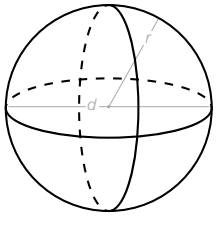
6. Calculate the volume of a single M&M using the formula for a sphere, where the radius is either the long radius or short radius.

7. Calculate the volume of a single M&M using the formula for a cylinder, where the cylinder's height is the short diameter.

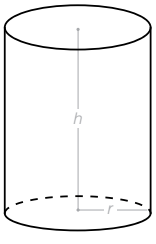
8. Calculate the volume of a single M&M using the formula for an ellipsoid, using the long radius for two of the axes and the short radius for the other axis.

9. How do your calculated volumes compare with the actual volume for a single M&M? Does a sphere, a cylinder or an ellipse seem like the best geometric model for an M&M?

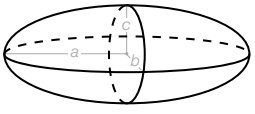
Find the full activity, including how to analyze your data, at snexplores.org/geometric. This activity is brought to you in partnership with Science Buddies.



SPHERE
Volume = ⁴⁄₃ ∏ r³



CYLINDER
Volume = ∏ r² h



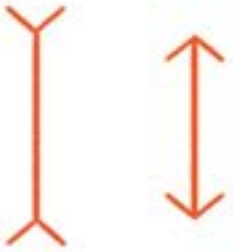
ELLIPSOID
Volume = ⁴⁄₃ ∏ a b c

DEBBISMIRNOFF/GETTY IMAGES; DASTAGIR/SHUTTERSTOCK

Written by Maria Temming
Illustrated by JoAnna Wendel

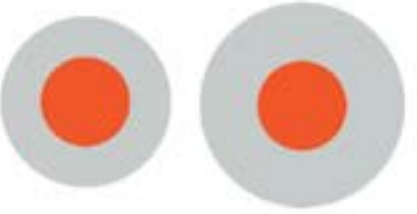
Optical Illusions Fool Hoofed Animals Too

Which of these two orange lines looks longer?



They're the same length! A visual trick known as the Müller-Lyer illusion just makes the left line seem longer.

Now, which of these two orange circles looks bigger?



They're the same size! But the Delboeuf illusion can make the left one seem bigger.

Scientists wondered if hoofed animals called ungulates are fooled by optical illusions, too. They worked with goats, llamas, sheep and guanacos at Germany's Leipzig Zoo.

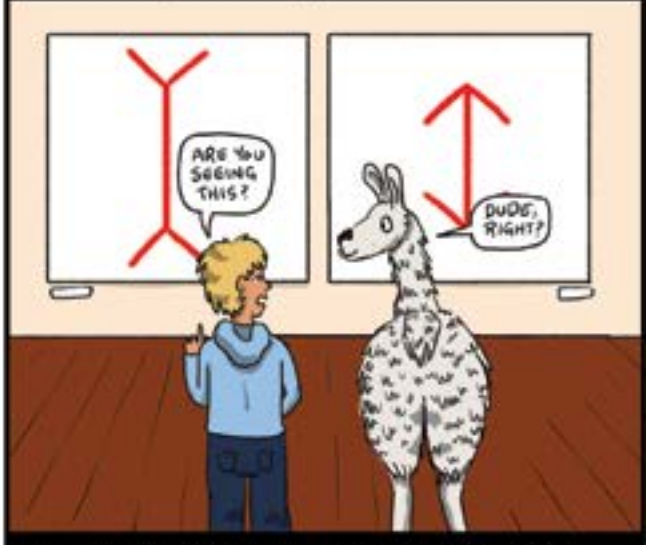
In a test of the Müller-Lyer illusion, the scientists offered each animal two carrots of the same length. One was between arrows pointing out, the other between arrows pointing in.

Ungulates usually picked the carrot between the inward-pointing arrows, suggesting they saw that carrot as bigger.

In a test of the Delboeuf illusion, researchers arranged veggies over a small or large circle.

The animals usually went for treats on the smaller circle, hinting they saw that as the bigger snack. "They really perceive [these illusions] in the same way as humans," says Alina Schaffer. She studies ungulate cognition at the University of Leipzig.

Better understanding how ungulates experience the world may encourage people to treat these pets and livestock well, Schaffer says.



"They're really intelligent," she says. "And they are maybe more similar to us than we think."

MATERIALS

Electric 'slime' might speed up healing

Squeezing the gel makes electricity that could attract healing cells

When hurt, some parts of our body — including bone and skin — use small electrical signals to call for healing help. A new gel that mimics these signals could boost healing.

EPIXIMAGES/SHUTTERSTOCK

When you break a bone or scrape an elbow, your body calls in healing cells. That S.O.S. takes the form of an electrical signal. A new gel that oozes like slime might someday boost that call.

The gel is piezoelectric. That means it generates electricity when squeezed or stretched, says Erica Pensini. An engineer, she works at the University of Guelph in Ontario, Canada.

Lots of materials in nature act this way. Our skin, bones, tendons and fingernails are all piezoelectric. Some humanmade materials are, too. But unlike many engineered materials, the new goo holds lots of water — like the tissues in our bodies. And all of its ingredients come from biological sources.

Pensini imagines that in the future, you could put a piezoelectric patch containing the gel on a wound to supercharge its healing. As the body's natural motions squish and stretch the material, it could trigger signals that mimic the injured area's call for help.

A HAPPY ACCIDENT

Pensini created the new gel by accident. For an experiment, she was

When squished, this goo releases a tiny zap of electricity.

This sample "slime" contains amino acids, water and a fatty substance called oleic acid. Erica Pensini first made the gel by accident, then discovered it could be pretty useful.

mixing water and amines — chemical compounds commonly used in shampoos and lotions. Then she added oleic acid, a component of fats such as olive oil. As Pensini mixed the sample, it morphed into a gel.

Intrigued, her team took a close look at the gel's electrical properties. In one test, they stuck metal electrodes into opposite sides of the goo. Then they squished the gel between two pieces of glass. Zap! The team measured a teeny jolt of electricity moving through the electrodes.

With so much water in the gel, Pensini realized its potential for first aid. All three ingredients were pretty human-friendly. But amines can irritate the skin. So she swapped them out for amino acids, which are found in the body and should be safe.

If you compress a pea-sized lump of goo to half its starting length, you might generate a few microamps of current. For perspective, you could get nearly a million times more from a standard AA battery. Fortunately, Pensini notes, processes in the human body use much lower levels of electricity.

Pensini's group shared its findings in the *Journal of Molecular Liquids* and *iScience*.

HOW THE INGREDIENTS WORK TOGETHER

Pensini made gels with different recipes, using various amino acids, amines and amounts of water. Her group measured the piezoelectricity of each with the same squish test.

The leading recipe was 90 percent water, oleic acid and lysine (an amino acid). It produced the biggest electrical signal among the gels made with amino acids.

The scientists also studied how the samples interacted with light. And they ran computer models and zoomed in on the gels using a microscope. These tests revealed a lot about the gels' structure.

Amino acids are like little batteries, Pensini explains. Each has a negative part and a positive part. If you line them all up the right way, they produce electricity — like batteries stacked inside a flashlight. But if you mix amino acids in water, they point in different directions. Nothing really happens.

Adding oleic acid to the slime proved key. It transformed the liquid into a gel that's easier to work with, Pensini says. "If you take that gel and you stretch it, or you squish it, then you can create the alignment." The amino acids line up and make electricity.

This only works if you mix the two ingredients in a lot of water, though. Otherwise, you end up with a brittle solid. Water also makes it easier for electricity to flow through the gel. Pensini's group is still studying how the gel's structure impacts its performance.

PUTTING THE GEL INTO ACTION

This material "has features that are promising for wound-care applications," says Ashley Brown. A bioengineer, she did not take part in the project. She works at North Carolina State University and the University of North Carolina at Chapel Hill.

It's important to see how well the gel works in healing experiments, she says. Its recipe might need tweaks for different clinical uses.

The "slime" could be useful in other ways too, says Seung-Wuk Lee. He's a bioengineer at the University of California, Berkeley. Like Brown, he did not work on the new gel.

Think about devices that go inside the body, such as pacemakers, Lee says. They always need an energy source, and "replacing the battery is a really big burden." With this type of gel, the body's natural motion could potentially power the device.

— *Kendra Redmond*

E. PENSINI

HUMANS

A real-life vampire probably couldn't survive on blood alone

Creating a bloodthirsty monster would need to undo millions of years of evolution

Vampires have been stalking the human imagination for centuries. These fictional creatures take many forms, including the famous Count Dracula and Morbius of the Marvel Universe. But most share one feature: long, razor-sharp teeth. These fangs help vampires bite the necks of victims to feast on their blood.

Many real bloodthirsty creatures exist in nature. As the only real blood-drinking mammals, vampire bats are perhaps the most famous. Mosquitoes and ticks also make the list, as do some spiders and moths. But it would be hard to turn a human — even an undead one — into a blood-drinking monster.

"We can't survive the way vampires do," says David Begun. This paleoanthropologist studies how apes, including humans, evolved. He works at the University of Toronto in Canada. In real life, no primates survive on blood, Begun notes. To do so, vampires would need to rework the mouths and guts that humans inherited from our plant-eating ancestors.

MY, WHAT BIG TEETH YOU HAVE

In popular media, vampires puncture skin using knifelike upper canine teeth. Humans occasionally use their canines to tear food, too. But any vampire would probably struggle to reliably break skin. "Our canines are completely unsuited to piercing

ILLUSTRATIONS BY STEVE MCCRACKEN

Vampire bats survive solely on blood, making them the only mammals to do so.

anything," says Begun. "They look more like incisors, our front teeth."

Human canines have slowly shrunk over time. Like many primates today — including our close cousins, chimpanzees and gorillas — our ancestors once sported large, pointed canines. These impressive teeth would have even sharpened themselves by rubbing against neighboring molars.

But these flashy teeth weren't primarily for eating. Instead, ancient apes most likely used them to intimidate rivals and defend themselves. Over time, these teeth shrank as our ancestors evolved to live in cooperative groups. Less fighting between males left little need for such large canines.

Vampires would have to revert to big canines, says Begun. Those teeth would also need to be much sharper, more like the teeth of vampire bats. Their two front incisors create tiny incisions in their prey. Unlike human teeth, they lack enamel. This keeps them permanently sharp. No primate has such sharp canines, says Begun.

A STOMACH FOR BLOOD

Vampires would also need help to digest blood to fuel their undead activities.

Blood isn't particularly nutritious. Low in calories, it's mostly made up of water and protein. With their humanlike guts, any vampire would probably suffer from malnutrition or even poisoning.

"Humans can't survive on blood alone," says Begun. We need a wider variety of nutrients than those present in blood.

Humans inherited our digestive systems from omnivores, or animals that eat both plants and other animals. Like today's chimpanzees, our ape ancestors probably ate mostly plants with some occasional meat, says Begun. Long, coiled intestines would have helped them break down tough plants. And gut bacteria likely helped further digest this food and absorb nutrients.

By about 2.5 million years ago, our ancestors started eating more meat. Later, humans started cooking with fire. That made digesting foods such as meat and tough plants much easier. Even more recently, people began growing starches such as grains to eat.

This led to tweaks in our digestive tracts. We started producing extra enzymes that could break down starches. Meat and other easy-to-digest foods could be broken down in shorter intestines. This resulted in bodies best suited to eating many different foods, says Begun.

While low in most nutrients, blood does contain lots of iron. But consuming too much of this mineral can be toxic to humans, who can't digest or excrete large amounts of it. This can damage organs, hurt the nervous system and even cause death.

Unlike humans, vampire bats have evolved ways to digest blood. Research suggests that they've lost a gene that blocks intestinal cells from absorbing too much iron. These cells are also short-lived and regularly shed. This lets vampire bats quickly absorb lots of iron and discard it through their waste. Meanwhile, their gut bacteria help break down proteins and produce extra vitamins not found in blood.

JUST NOT IN OUR BLOOD

Scientists are still trying to understand why vampire bats started feeding on blood. Some suspect the habit arose from bats that fed on parasites such as ticks. Perhaps the bats eventually started feeding on the blood oozing from wounds left behind when they scarfed down these pests.

Whatever led bats to their taste for blood, it's clear humans weren't shaped by those same evolutionary pressures. And changing how a real species eats usually requires tens of thousands, if not millions, of years of evolution. That's a lot more involved than the single bite needed to make a fictional vampire.

Still, this reality shouldn't stop movie-goers from enjoying vampires, Begun says. "It's still OK to enjoy a vampire movie or a vampire TV show, even if it's not actually feasible."

— Aaron Tremper

With their humanlike digestive tracts, vampires would probably starve in real life. That's because our bodies evolved to rely on a wide array of foods that includes vegetables, meat and grains.

HUMANS

Purple exists only in our brains

The color is our brain's solution to a puzzling problem

There's something unique about the color purple: It doesn't exist in nature. Our brain makes it up to cope with conflicting information.

To understand where purple comes from, we need to know how our eyes and brain work together to perceive color.

It starts in our eyes. The backs of our eyes contain light-sensitive cells called cones. Most people have three types. Each type is most sensitive to a certain range of light wavelengths.

The full range of light we can see is known as the visible light spectrum. It spans wavelengths between around 380 and 700 nanometers. We see this range as the rainbow: red, orange, yellow, green, blue, indigo and violet.

When light enters our eyes, the specific combination of cones it activates is like a code. Our brain deciphers that code and translates it into a color.

Any color within the visible rainbow can be created by a single wavelength of light stimulating a specific combination of cones.

But purple is a mix of red (long) and blue (short) wavelengths. Those colors are on opposite ends of the spectrum. So it can't be represented as a single wavelength of light.

Seeing something that's purple, such as eggplants or lilacs, stimulates both short- and long-wavelength cones. This confuses the brain.

To cope, the brain improvises. It takes the visible spectrum — usually a straight line — and bends it to create a color wheel. Then it pops in a palette of purples as a solution to why it's receiving information from opposite ends of the visible spectrum.

This explains the difference between violet and purple. Violet is a spectral color — part of the visible spectrum. It only takes one wavelength of light for our brain to perceive a spectral color. Purple, however, is a *nonspectral* color. It's made of two wavelengths of light, one long and one short.

And it's a fascinating example of how the brain creates something beautiful when faced with a systems error.

— *Tammy Awtry*

Our eyes contain three types of cones, and each type is most sensitive to a certain range of wavelengths.

Long-wavelength cones (sometimes called red cones) are most active for light at the **red** end of the visible light spectrum.

Mid-wavelength cones (sometimes called green cones) pitch in to detect **orange** but are most sensitive to wavelengths of light in the middle of the rainbow. They get help from long-wavelength cones to signal **yellow** and short-wavelength cones for **green**.

Short-wavelength cones (sometimes called blue cones) are most active for light at the **blue** and **violet** end of the spectrum.

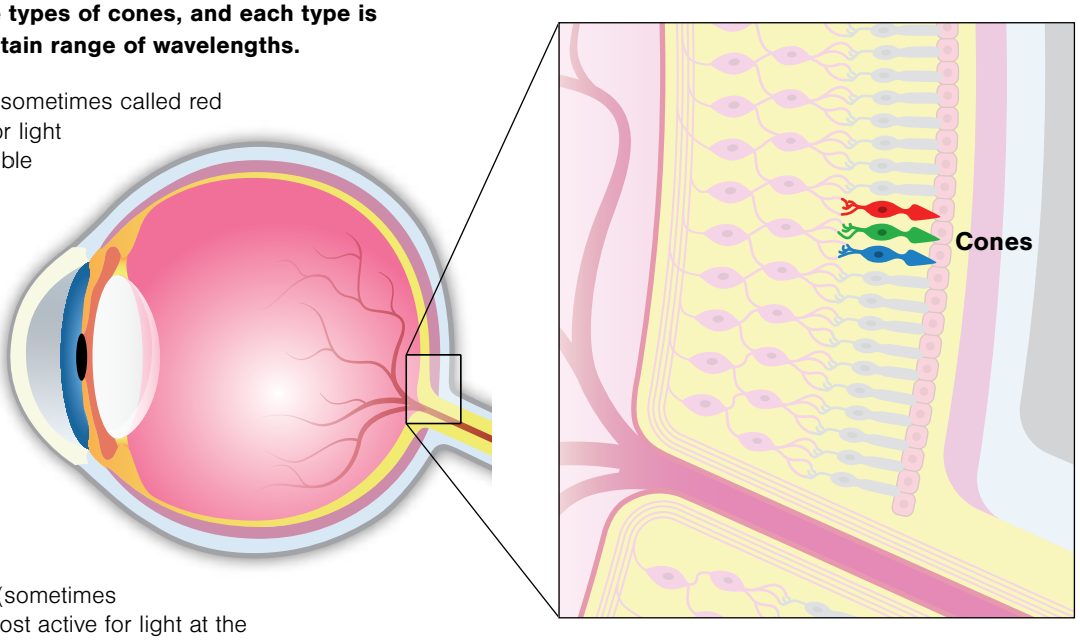
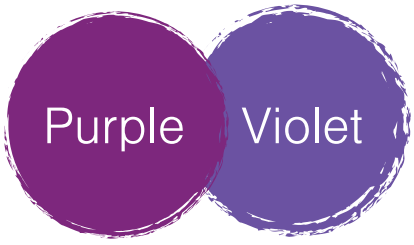
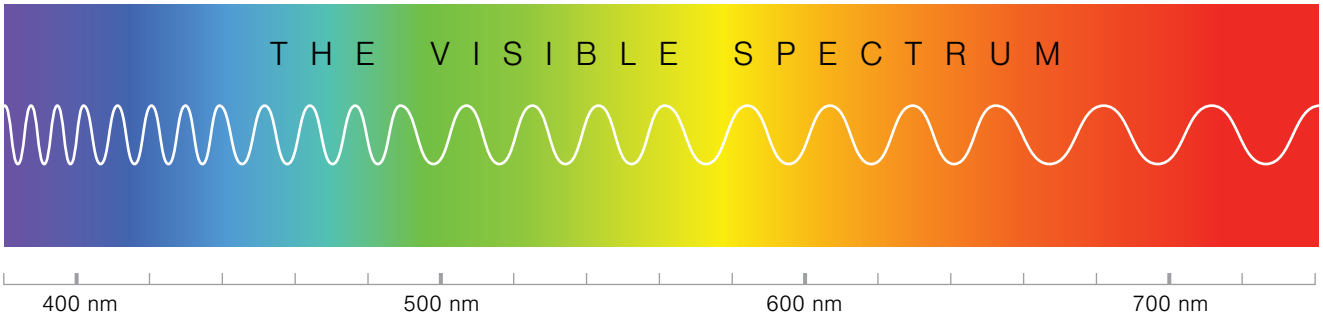


ILLUSTRATION BY STEVE MCCRACKEN

HOW WE SEE COLOR





SHORT-WAVELENGTH CONES
~360–510 nanometers

MID-WAVELENGTH CONES
~420–640 nanometers

LONG-WAVELENGTH CONES
~420–690 nanometers

Our brain bends the visible spectrum to make red and blue neighbors. Then it adds purples to create a color wheel.

ILLUSTRATIONS BY STEVE MCCRACKEN

ANIMALS

Birds of paradise glow under certain types of light

Gleaming bills, bellies and other body parts may help woo mates

To attract a mate, male *Ptiloris paradiseus* birds of paradise fan their dark wings around their face. They'll gape — mouth wide open — at a female for 30 seconds or more. Under bluish light, their open mouths glow, standing out against the birds' black feathers.

Male birds of paradise can really put on a show. Adorned with striking colors, they use snazzy dance moves to woo potential mates. Now, it seems the flamboyant flyers have one more trick up their wing to heighten the drama of their displays. Under bluish light, many male birds of paradise have glowing body parts.

This type of gleam is called fluorescence. It occurs when an object absorbs light at one wavelength and then shines light of a lower energy.

Fluorescence "is becoming more and more well-known across the tree of life," says Rene Martin. She's a biologist at the University of Nebraska–Lincoln. Martin has studied fluorescence in deep-sea fishes. Scientists have also found fluorescence in some amphibians and mammals and a handful of birds.

Martin went looking for fluorescent birds while working at the American Museum of Natural History in New York City. The museum has specimens of all 45 species of birds of paradise. Birds of paradise are found in the forests of Papua New Guinea, eastern Indonesia and eastern Australia.

Martin swept through the collection, shining a blue light flashlight over the birds' bodies. That color light can prompt some animals to fluoresce. Martin wore yellow goggles that filter out blue light so she could see which birds gleamed green-yellow. Of the 45 species, 37 fluoresce, her team reported in *Royal Society Open Science*.

SWAROOP PIXS/SHUTTERSTOCK

That fluorescence seems to help birds attract a mate, Martin says. Several pieces of evidence point to this. For one thing, past studies have suggested that birds can see fluorescence. For another, male birds often perform mating dances in areas where they can soak up sunlight containing ultraviolet (UV) or blue wavelengths that kick off fluorescence. And the birds' glowing parts are often on or near parts of their body used in displays.

What's more, the fluorescent parts tend to appear against a contrasting background. For example, some male birds fan black wings around their faces. Against the dark feathers, a glowing mouth — gaping wide open at a female — can really pop.

Martin hopes to study live birds to confirm whether males' fluorescence actually makes them more alluring to females.

— Carolyn Wilke

DATA DIVE

1. Look at Figure A. Which wavelengths correspond to green-yellow glows in birds of paradise?

2. What are some of the birds' body parts that glow?

3. Look at Figure B. On *Parotia berlepschi*, which part glows the brightest? How does this compare with its black feathers?

4. Look at Figure C. How does the brightness of UV excitation light compare with the birds' glow (the peak at 500 nm)?

5. Think about how birds of paradise use their glowing features. What other animals do you think may fluoresce?

GLOW UP

FIGURE A

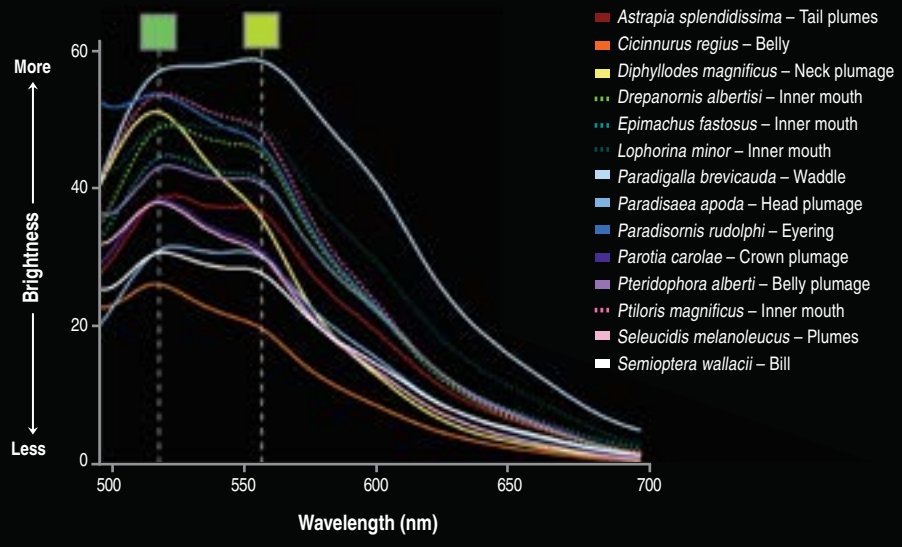
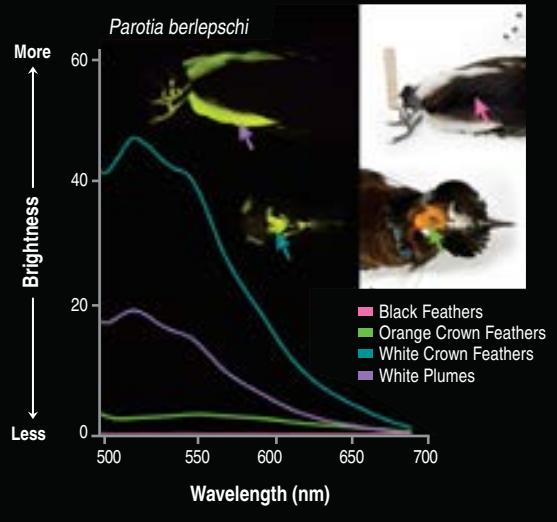
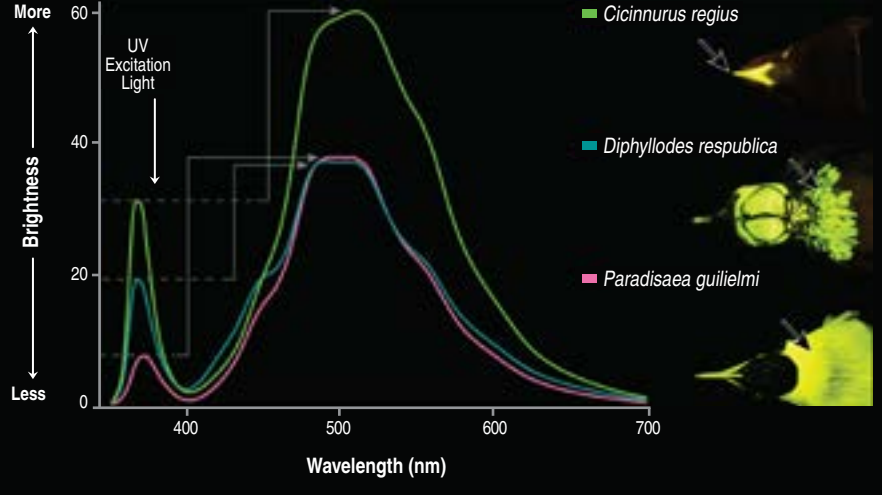


FIGURE B



Rene Martin placed specimens of different birds of paradise under blue light. She photographed them with a camera using a filter that cut the blue light. That allowed the preserved birds' greenish gleam to show up in pictures. Martin also used a special tool called a spectrophotometer to measure the wavelengths of light that the birds gave off. The graphs show these data. The x-axis shows the wavelength of light. The y-axis shows how bright that light is. Figure A plots the glows of different species. Figure B shows the glow of different parts of a bronze parotia (*Parotia berlepschi*). Figure C compares how parts of a few different species glow under UV light.

FIGURE C



ANSWER

This one-legged robot leaps like a squirrel

The hopping bot is the first to land — balanced — on a thin tube

Salto the robot is acting a bit squirrelly. It can take a flying leap and land on a narrow pipe, just like a squirrel soaring from branch to branch. The Salto team reported its results in *Science Robotics*.

Squirrels have exceptional balance. Even if a jump carries them a bit beyond or short of their target, squirrels can adjust to stay upright. One way is by changing how hard their legs push against a branch as they land.

Salto can make similar adjustments. It can stand or crouch to improve its balance. And a clawlike gripper on its foot helps the robot catch and land on pipes.

In lab tests, Salto leapt from one plastic pipe to another. It successfully did this 25 times out of 30 attempts. Most of the time, it swung over or under the tube. In just two trials, Salto leapt, landed and perched perfectly upright on the pipe.

Future robots may be even more agile than Salto. For instance, they might hop onto pipes or beams at construction sites while carrying cameras for inspection. Or maybe Salto could leap through a forest as an environmental monitor.

— *Meghan Rosen*

To boost Salto's balance, researchers want to improve the robot's gripper to better grasp the pipe it lands on — like a squirrel squeezing a branch with its toes.

JUSTIN K. YIM AND ERIC K. WANG

INSIDE THE MIND OF A YOUNG SCIENTIST

A Regeneron International Science and Engineering Fair finalist answers four questions about her science

Science competitions can be fun and rewarding. But what goes on in the mind of one of these young scientists? Nichelle Thinagar, a finalist at the 2025 Regeneron International Science and Engineering Fair, shares her experience.

Q What inspired your project?
A An earthquake on March 28 trapped hundreds of people in the ruins of collapsed buildings in Myanmar, a country in southeast Asia. Nichelle saw this disaster on the news. "There were so many more people left unaccounted for, trapped under rubble," Nichelle recalls. Stories like this compelled her to design a snakelike rescue robot.

Q What challenges did you face?
A Nichelle hoped to test different scale designs with computer models before building a full robot. In particular, she wanted to test the stickiness between her design's artificial scales and the surfaces below them. But many factors play into how different scales slide across surfaces, Nichelle learned. "That's just something that the simulation software couldn't compute." To test snake scales, she had to build a real snake robot.

Q What was your favorite part?
A "Putting the whole prototype together," Nichelle says. "As much as working on components is fun, I enjoy seeing the full system."

Q What's next for you?
A "I'm actually presenting my work at my state's urban search and rescue task force," Nichelle says. There, she plans to gather feedback that may help improve her design. She already has some ideas for building a bigger, better version of the robot and hopes to find a university lab where she could access the equipment do this work.

Regeneron International Science and Engineering Fair finalist

Nichelle Thinagar

Nichelle, 16, developed a snakelike robot that could slither through rubble to find and help people in collapsed buildings. Scales on the underside of the robot help it grip surfaces to push itself forward. A small compartment in its head can haul water or other supplies. Nichelle is a sophomore at Shrewsbury High School in Massachusetts.

Learn more about the Regeneron International Science and Engineering Fair

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