
muse®
THE MAGAZINE OF LIFE, THE UNIVERSE, AND PIE THROWING
VOLUME 18, NUMBER 6
JULY/AUGUST 2014
Exploring the Dark Side of a Glacier page 6
The Animal Kingdom's Criminal Underworld page 29
World's Cutest Underbellies page 25

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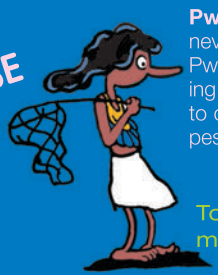
THE MAGAZINE OF LIFE, THE UNIVERSE, AND PIE THROWING

to it, like a wet tongue on a metal fence post in winter. But the ice here was damp—a result of being warmed ever so slightly by heat seeping up from the earth's interior. For the first time ever, Gulley and Benn were very close to the bottom of a glacier.

Benn noticed something: his jacket was no longer freezing to the ice. The ice higher up in the glacier had been very cold. Their clothing had frozen

MEET A MUSE



Pwt is the Muse of Animals, though you'd never know it to watch him chase Crraw. Pwt sometimes lies awake at night worrying about abandoned pet hamsters, how to dodge Kokopelli's next pie, and why that pesky crow always seems to outsmart him.

To meet the rest of our Muses, go to musemagkids.com/muses.

This Month's Mystery Quote

"AGGGG!!!"

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contents

REGULAR STUFF

2.....Kokopelli & Company
by Larry Gonick

3.....Dear *Muse* Reader
by Nancy Kangas

4.....Bo's Page

17.....Q&A
by Lizzie Wade

20.....Muserology: Par Sublime
by Année R.

36.....*Muse* Mail

38.....*Muse* Contest

Last Page.....Oh, Heck

NEW STUFF

6....The Frozen Underworld
by Douglas Fox

13.....The Nobel Prize's Not-So-Noble Side
by Mark Jackson

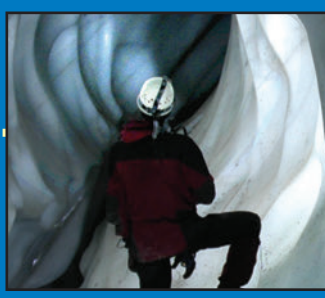
18.....Forecast: Sunny Underground
by Meg Moss

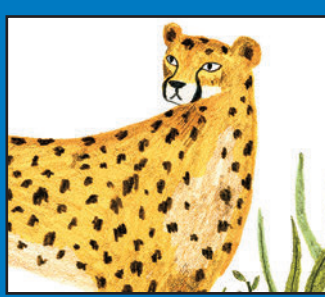
22.....Anemones on Ice
by Jane J. Lee

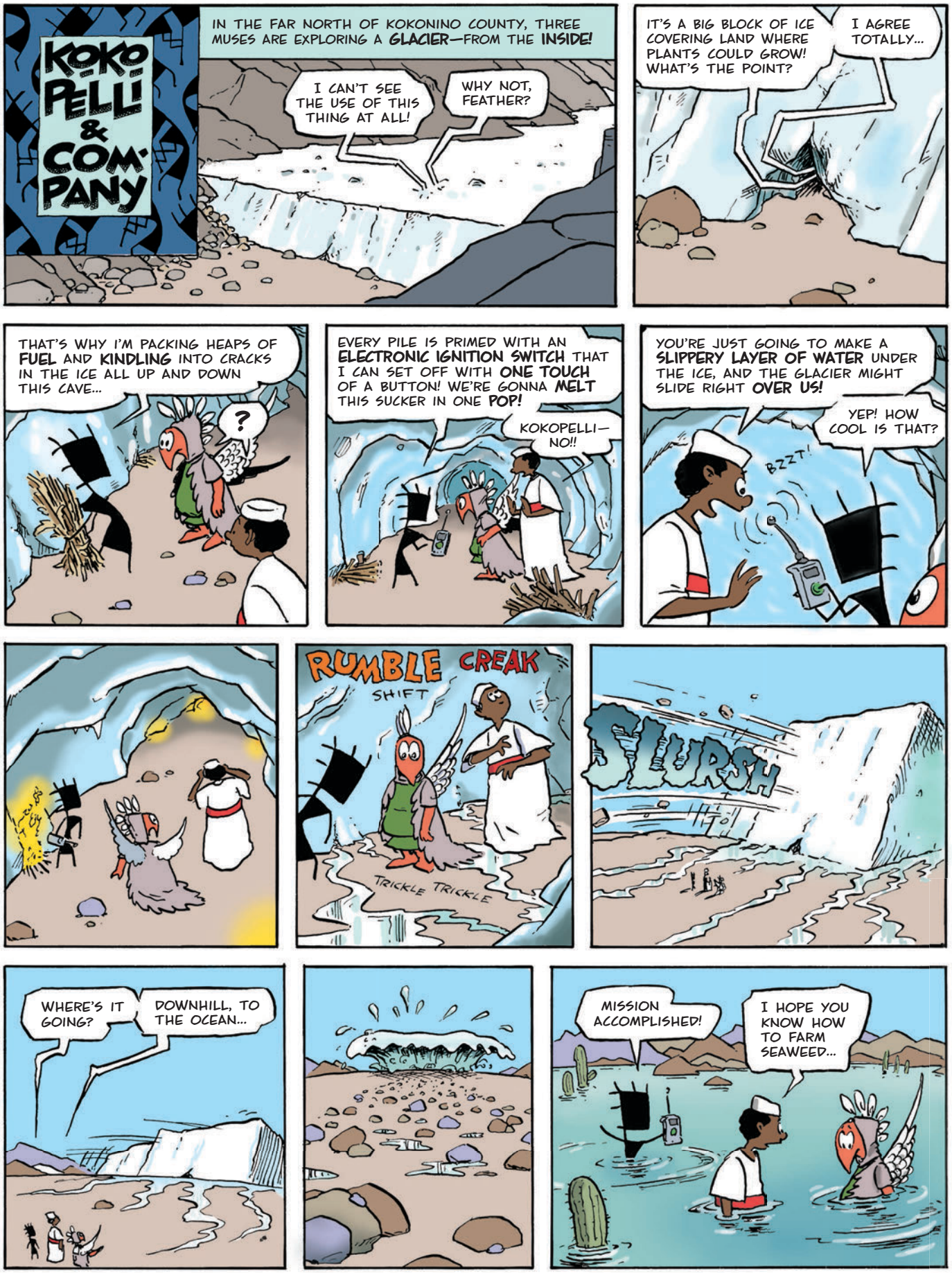
25.....Lemur Bellies You Should Know
by Elizabeth Preston

29.....When Animals Steal
by Dan Riskin








KOKO-PELLI & COMPANY
IN THE FAR NORTH OF KOKONINO COUNTY, THREE MUSES ARE EXPLORING A GLACIER—FROM THE INSIDE!
I CAN'T SEE THE USE OF THIS THING AT ALL!
WHY NOT, FEATHER?
IT'S A BIG BLOCK OF ICE COVERING LAND WHERE PLANTS COULD GROW! WHAT'S THE POINT?
I AGREE TOTALLY...
THAT'S WHY I'M PACKING HEAPS OF FUEL AND KINDLING INTO CRACKS IN THE ICE ALL UP AND DOWN THIS CAVE...
?
EVERY PILE IS PRIMED WITH AN ELECTRONIC IGNITION SWITCH THAT I CAN SET OFF WITH ONE TOUCH OF A BUTTON! WE'RE GONNA MELT THIS SUCKER IN ONE POP!
KOKOPELLI— NO!!
YOU'RE JUST GOING TO MAKE A SLIPPERY LAYER OF WATER UNDER THE ICE, AND THE GLACIER MIGHT SLIDE RIGHT OVER US!
YEP! HOW COOL IS THAT?
BZZT!
RUMBLE
CREAK
SHIFT
TRICKLE TRICKLE
SLURSH
WHERE'S IT GOING?
DOWNHILL, TO THE OCEAN...
MISSION ACCOMPLISHED!
I HOPE YOU KNOW HOW TO FARM SEAWEED...

Dear Muse Reader,

What are the best ways to make someone blurt out the word "underwear"? Our researchers have been working to answer this question, and they've classified the most statistically reliable methods as follows. We believe you will be able to use these with good results.

THE 10 ESSENTIAL WAYS TO MAKE SOMEONE SAY "UNDERWEAR"

The Classic
What's under there?!

The Classic (with Mice)
Wow! I can't believe I just saw a mouse run under there!

The Direct
Hey, what are you wearing under your clothes?

The Direct (with Elephants)
Hey, what do elephants wear under their clothes?

Big Tough Guy Classic
I'm a Big Tough Guy. You, Non-Tough Guy—get under there!

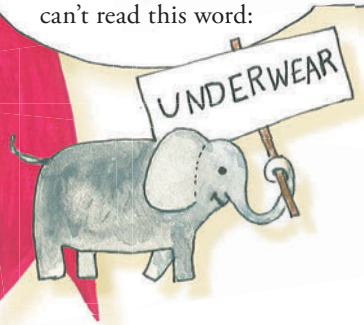
The Confusingly Obvious
What would be a good thing to sell at a store called All Kinds of Underwear?

The Literary
I am working on this poem. Can you help me—what's the opposite of "over what"?

The Advanced Literary
I am working on this poem. Can you help me—what's the opposite of "derware"?

The Advanced Literary (with Urgency)
I'm writing a poem! QUICK—what's the opposite of "derware"?!

The Confuse a Big Tough Guy
Hey, Big Tough Guy—I bet you can't read this word:



Computers Spot Fake Emotion

You're watching the World Cup on TV when one player collides with another and falls down, grabbing his knee and grimacing. Is he really in pain, or just faking so the ref will call a foul? It's hard for a person to tell the difference. But it's easier for a computer.

Scientists made videos of people who were either in pain (because they were holding their arms in a bucket of ice water) or pretending to be in pain. Then another group watched the videos and guessed who was really hurting. People were terrible at this—they might as well have guessed randomly.

Then the scientists trained a computer to look for patterns in humans' lips, eyebrows, and other features and to detect fake emotions. The computer got the right answer 85 percent of the time—not bad for a machine with no emotions at all.

Sewer Taters Are No Legend

Sewer gators, the alligators said to live beneath New York City, are only an urban legend. But thanks to diners and burger joints, sewer *taters* are taking root in urban areas across the United States.

City inspectors first discovered the hidden potato plants growing in the sewer system of Houston, Texas. Biologists who came to investigate found that the plants were sprouting from potato peelings dumped down the drain by chefs preparing French fries. If any of these scraps contain "eyes"—the stubby sprouts that emerge from older potatoes—they may start growing, even in the sewer.

Scientists say sewer taters, which grow in very little light, show how hardy potato plants can be. They note, though, that sewers contain plenty of good fertilizer.

Lizards Can't Resist a Lady with an Orange Belly

There's nothing as attractive as a bright orange, splotchy belly—at least to a male lizard.

Female dragon lizards, a species living in southern Australia, develop vivid orange patches on their underbellies when they're looking for a mate. After they've gotten pregnant and laid eggs, their patches disappear, leaving females with plain white tummies. Scientists wondered whether male lizards pay attention to these patches. So they painted artificial orange spots onto some female lizards' bellies and covered up others' spots with white paint.

Males didn't show much interest in the females with white bellies. But they were very attracted to the females with small, bright orange spots, even if they were fake. (Male dragon lizards show interest with head bobbing and push-ups, if you were wondering.)

Genetically Engineered Trees Make Better Paper

The problem with turning trees into pulp to make paper or other products is that trees are so . . . well, *woody*. A molecule called lignin lines a tree's cell walls, making them stiff. Papermakers have to use a lot of chemicals and energy to break lignin down and get it out of the wood.

Now a group of scientists has taken a step toward making that process easier. The scientists snipped out a bit of the DNA of a Chinese herb and inserted it into the genes of poplar trees. The DNA puts weak links in the herb's lignin, and the scientists hoped it would do the same in the trees.

The poplars grew as big and strong as ever. But because of the weak link in their lignin, their wood could be chemically broken down more easily. This kind of genetic engineering could help papermaking become more energy efficient—good news for everyone except the trees.

Cows That Live with a Buddy Are Smarter

You probably shouldn't hire a cow as your math tutor, but cows are able to learn simple things. And that learning may come more easily to cows who live with a friend.

Scientists in British Columbia, Canada, raised some young calves in pens by themselves, while others lived in pairs. Then they gave the calves IQ tests. In one test, calves had to repeatedly choose between a white box and a black box—one color always hid a bottle of tasty milk, the calves learned, and the other was always empty. Then scientists switched the colors. Calves that lived alone took longer to figure out the new system.

In the second test, scientists repeatedly left a red plastic bin in the calves' pens. All calves sniffed and nudged at it. But cows living in pairs eventually got used to the bin and ignored it. Cows that lived alone kept reacting as if they'd never seen the bin before.

Calves that live alone may learn more slowly because they're anxious or scared, scientists say—or even bored. Whatever the reason, keeping cows together might help them adjust to changes on the farm.

Your Cereal Is Looking at You

Your favorite cereal-box character wants to be your friend. How can you resist those smiling cartoon eyes, looking just as sweet as the crunchy tidbits behind them? It's no coincidence if you feel like that cartoon mascot is looking right at you. Characters on cereal boxes are designed to stare into your eyes from their grocery-store shelves.

Researchers studied 86 cereal-box characters in 10 American grocery stores. They found that cereal made for adults is usually kept on a high shelf, and the characters on the boxes look straight ahead, where an adult's gaze would be. But cereal for kids is kept on lower shelves, and the characters look slightly downward—meeting the gaze of passing children.

Cereal companies may illustrate their characters this way to trick you into feeling a connection to their brands. Guess your cardboard friend isn't so sweet after all.

The false fact is "Sewer Taters Are No Legend."

The Frozen Underworld

by Douglas Fox

Scientists are descending into the dangerous, ever-shifting ice caves beneath glaciers to learn about climate change—and to see a side of the earth that no one's ever visited before.

Jason Gulley had been trying for years to explore deeper into the cave. Each time, he was blocked in the same place, where the cave's solid-ice ceiling dipped too low for him to squeeze through. But he finally got past this bottleneck one day in September 2012. After four hours of scrambling in the dark, down twisting tubes of rippled ice, he found himself in a large room that he had never seen before.

The floor and walls were made of rocks and gravel frozen together by ice; the ceiling was made of blue ice, studded with boulders frozen into it. Gulley could see that one boulder the size of a dishwasher had recently fallen: it lay on the floor, leaving a gaping hole in the ceiling where it had come from. Gulley did not trust this place. And no wonder: below his boots lay solid bedrock, but above his head sat 350 feet (110 meters) of slowly shifting ice.

Gulley studies underground rivers; he's a geologist at Michigan Tech University. He and two other scientists came to this place high in the Arctic, on the Norwegian island of Spitsbergen, to explore a hidden world. They hiked to a lifeless, rocky canyon where a conveyor belt of ice three miles (five kilometers) across oozes downhill. This glacier, called Hansbreen (*breen* is Norwegian for "glacier"), creeps forward a few feet per year in the area they were exploring.

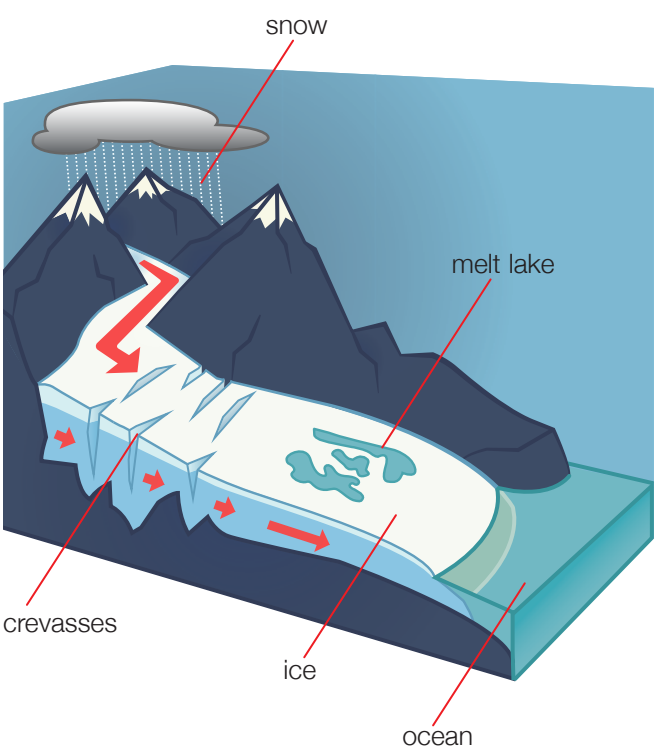
Once at the glacier, they descended by rope into a crack in the ice. The *clink*s and *crunch*es of their ice axes and spiked climbing boots echoed off the ice walls, drowning out conversation. Eventually they reached the bottom of the glacier, where the ice rests on the earth.

Scientists these days are curious about the invisible rivers that flow beneath glaciers, under hundreds or even thousands of feet of ice. This water can help ice slide more quickly over bedrock. Scientists have known for years that glaciers in Greenland, Spitsbergen, and elsewhere can briefly speed up in springtime, even doubling their speed for a few days. It happens as water melts off the top of the glacier, plunges down cracks in the ice, and spurts through passages under the glacier.

"All glaciologists know that the flow of water through glaciers is really, really important," says Doug Benn, a glacial scientist at the University Centre in Svalbard, on Spitsbergen. "If there's water between

An ice cave in Nepal looks otherworldly. On the previous page, Matt Covington climbs out of the glacier named Hansbreen.

Matt Covington rappels into a cave on Hansbreen.



A glacier forms from falling snow that's gradually compressed into ice. Hundreds of feet down, this ice starts to slowly ooze downhill. Warm weather may create ponds on the glacier's surface; these can leak through cracks in the ice and reach the very bottom of the glacier, where the water speeds up its travel. Some glaciers flow all the way to the sea.

the glacier and the bed, it can be incredibly slippery, and that means the glacier can flow fast." The rising temperatures caused by climate change could produce more meltwater, making glaciers speed up in places like Spitsbergen and Greenland. Many of these glaciers end at the coast, dumping icebergs straight into the ocean, where they will melt. So speeding them up for even part of the year could make sea levels rise faster.

Gulley came to Hansbreen with two other young scientists, Matt Covington from the University of Arkansas and Ken Mankoff of the Woods Hole Oceanographic Institution in Massachusetts. They had to time their visit perfectly, since these ice caves only exist for part of the year. The caves form each summer as meltwater pulses through the glacier—then disappear again each autumn. If Gulley and his friends entered the cave too early, they'd find their way blocked by gushing water that could wash a person away to certain death under the ice. If they arrived too late, the ceiling of the cave would already have squished back down like Silly Putty from the immense weight of the glacier overhead.

As Gulley stood in the room beneath the glacier that day, the air smelled of wet dirt. Boulders hanging from the ceiling cast shadows in

Doug Benn explores an ice cave in Svalbard, Norway.

Jason Gulley navigates a tight squeeze.

the beam of his headlamp. Gulley had timed things perfectly. The ceiling of rock and ice would collapse in the coming weeks. Whether it would happen slowly or suddenly, no one could say. But for now it was holding, and he and his friends had work to do.

"Just Too Crazy"

Gulley never imagined himself crawling through ice tunnels. He wears delicate wire-rim glasses, has a beard several inches long, and used to keep his reddish-brown hair in dreadlocks. He grew up in Ohio, exploring the limestone caves in nearby Kentucky. By the time Gulley was in college, he had begun scuba diving inside underwater caves along the coasts of Florida and Mexico.

Gulley was 25 years old, studying at Eastern Kentucky University how limestone caves form, when a friend introduced him to Benn, the glaciologist. Benn was interested in the meltwater lakes that form on top of glaciers in the Himalayan Mountains of Asia, near Mount Everest. These deep blue lakes can grow 500 feet (150 meters) wide; they help to melt glaciers by absorbing warmth from sunlight.

But Benn was seeing strange things happen. Sometimes a lake disappeared—the water drained through caves that suddenly opened in the ice underneath it. "We kind of knew that there were all of these strange holes inside the glaciers," says Benn. "But we had no idea at all what was in there."

Answering that question would require exploring the caves—something Benn wasn't about to try. It's one thing to enter a cave made of stone that has been stable for thousands of years—and quite another to climb inside a glacier where the ice is always shifting, sliding, melting, and cracking. "Going into one of these things was just too risky," he says. "We thought it would be just too crazy."

It wasn't until Benn met Gulley in 2004 that the idea even seemed possible. Gulley was familiar with how water trickling through cracks in limestone gradually dissolves minerals and etches out caverns from layers of solid stone. The shape of a cave provides clues to how it formed, and Gulley convinced Benn that they could figure out how these glacial caves were forming if they could just get inside them. And so Benn, who had never stepped inside a cave, teamed up with Gulley, who had never seen a glacier.

Benn and Gulley explored their first ice caves together in 2005, inside several glaciers near Mount Everest. Gulley had done plenty of limestone caving and rock climbing, but found ice caving just a teeny bit terrifying. He and Benn slipped down vertical cave

Water pours into a vertical crack called a moulin on the surface of a glacier in Greenland.

shafts using ropes that were anchored to the ice with screws. Sometimes, Gulley and Benn found icicles as big as baseball bats hanging from the walls of a shaft. They kicked at these, sending them crashing into unseen depths below—far better than having them drop on their heads later on. One time, Gulley suddenly fell six feet (two meters) through the floor of the cave where he and Benn were walking. They realized afterward that they had been walking on a false floor: a crust of ice only inches thick.

Those first ice caves, with rippled, glassy ceilings 20 feet (6 meters) high, blew away anything they expected. Thousands of people visit Mount Everest each year, says Benn, "and yet right beside the trail there were big cave systems inside these glaciers that nobody knew existed."

As Benn and Gulley explored glacial caves in the Himalayas and Spitsbergen, they discovered a couple of important things. First, that Gulley's dreadlocks had a nasty habit of turning to icicles. (Gulley cut them off and grew a ponytail instead.) And second, that these ice caves were forming in much the same way that limestone caverns like Kentucky's Mammoth Cave had formed over eons.

In Spitsbergen, the process begins when melt lakes drain into brittle cracks, called crevasses, in the glacier. The sheer weight of the water pouring in drives the crack deeper and deeper, like an ax blade splitting a log along the woodgrain. Once the crack reaches the bottom of the glacier, the water gushes along underneath, melting a passage in the underside of the ice. "Take everything that it takes to form Mammoth Cave over a million-year timescale, and condense all of those processes down to a single year," says Gulley. "That's more or less what happens" every summer in the glaciers of Spitsbergen.

The ice caves that Gulley and Benn initially explored were relatively shallow. But they still wanted to visit the bottom of a glacier. They wanted to see the hidden riverbeds underneath, where water flows for miles.

They first accomplished this in 2006. A Polish glaciologist named Artur Adamek guided them to an ice cave in Spitsbergen that was believed to reach the bottom. After an hour in the dark, Benn, Gulley, and Adamek sat in a narrow, V-shaped tunnel, with their spiked boots stuck in one wall and their backs pressed against the other wall. It was then that Benn noticed something: his jacket was no longer freezing to the ice.

The ice higher up in the glacier had been very cold. Their clothing had frozen to it, like a wet tongue on a metal fence post in winter. But the ice here was damp—a result of being warmed ever so slightly by heat seeping up from the earth's interior. For the first time ever, Gulley and Benn were very close to the bottom of a glacier.

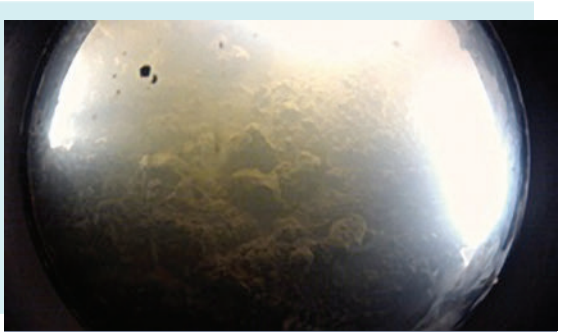
A Hidden World

Before Gulley and Benn began exploring, scientists didn't know much about the spaces beneath glaciers. Hundreds of lakes are known to hide under the vast ice sheets that cover Antarctica and Greenland. Subglacial rivers flow between these lakes. Scientists had only seen them indirectly, through ice-penetrating radar and other types of remote sensing.

In 2013, scientists finally drilled into one of these lakes: Lake Whillans, hidden under 2,600 feet (790 meters) of ice in Antarctica. They managed to bring up samples of water and mud from the lake before their hole in the ice froze and squeezed back shut. They found microscopic bacteria that had survived up to a million years under the ice. A camera lowered into the lake showed hazy wisps of mud churning in yellow, mineral-rich water. The scientists tried to lower a remote-controlled submarine to explore further—but it malfunctioned before reaching the lake. That is all scientists have seen of the vast world hidden under glacial ice—a world nearly twice as large as the United States.

Gulley and Benn have spent the last five years exploring the subglacial riverbed under Hansbreen.

A murky view of Lake Whillans, buried deep under Antarctic ice.



Ken Mankoff explores a tunnel under Hansbreen. He's been experimenting with using a modified Microsoft Kinect—the tool that lets you play interactive Xbox games—to map the insides of ice caves. The Kinect keeps its eye on gamers by sending out a pattern of infrared lights; in a cave, those same lights can capture the shape of the walls.

Is risking your life for science ever worth it? Share your thoughts at musemagkids.com/townhall. It's risk free.

The first time they went there, in 2008, they spent a week crouching and ducking through low-slung passages with rocks below and ice above. A cold breeze flowed through the cave, chilling their faces and stirring the fog of their breaths. Gulley and Benn measured each section of cave, sketching it in a notebook. The meandering passages branched and rejoined themselves many times.

Gulley and Benn realized that this hidden river had a surprisingly familiar form. It resembled a so-called braided river. Rivers like this are common in dry places like the southwestern United States: wide and shallow, with many intertwining or "braiding" channels, separated by sandbars that shift over time.

Finding braided channels (rather than a single deep riverbed) under a glacier was important. Water surging through braided channels can easily spread into areas beside the channels, efficiently lubricating the ice. It isn't the only thing that can cause glaciers to speed up and lose more ice. Scientists have found, for example, that ocean currents melting the floating ends of glaciers also cause them to speed up. But subglacial rivers could make things even more slippery in the coming years, as rising temperatures melt more water on the tops of glaciers.

Gulley has crawled into the riverbeds under Hansbreen every year since 2008. He always wanted to venture farther down the tunnel, but was stopped in the same narrow spot—at least until September 2012, when he and his companions finally scampered through.

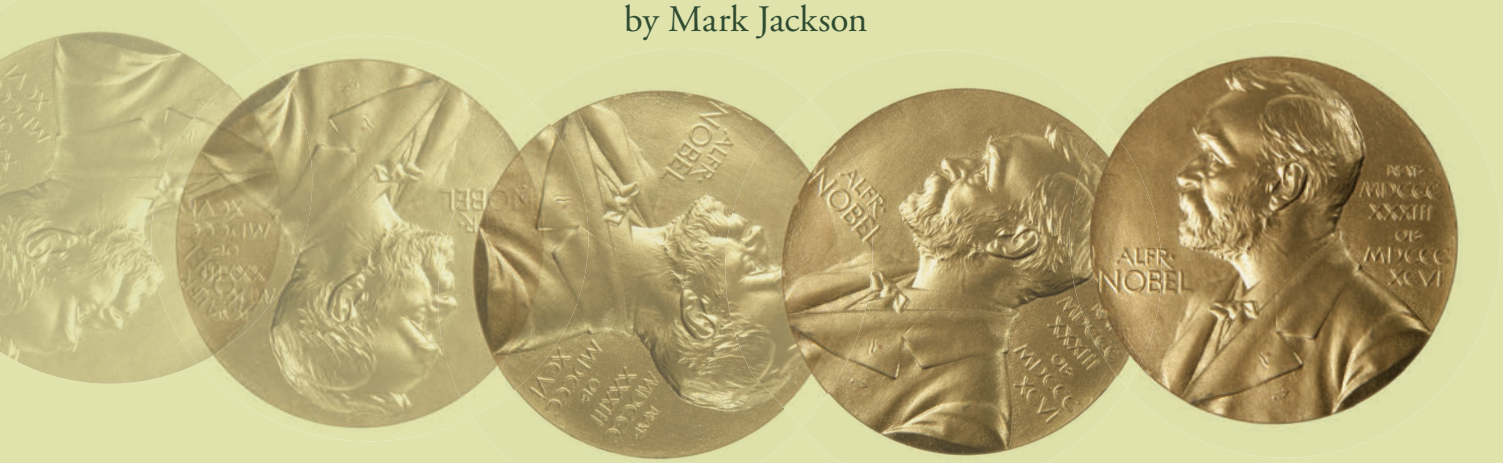
Gulley, Mankoff, and Covington spent several hours mapping the new section of cave that day. Now and then a loud *thunk* shattered the quiet—a rock as big as a basketball falling from the ceiling. They avoided the center of the cave, where the biggest rocks hung from the ice. The walls were unstable too. Water flowing under the glacier had cut this passage through loose rocks and gravel, like a tunnel dug in beach sand. Gravel crumbled from the walls, suggesting that they could collapse and trap the three men. "We decided that we didn't want to be in that section of the cave anymore," says Gulley. He and his friends ventured no farther that day.

But they'll be back, and so will others. The study of glacial caves (a field called glacial speleology) did not even exist a few years ago. Now Gulley, Benn, and a few other scientists are venturing underneath glaciers and finding clues that could answer important questions—not only about climate change and glacial speedups, but also about what types of life might inhabit these vast, unexplored environments.

Douglas Fox is a science and environmental writer who lives in Northern California. Although he hasn't been underneath a glacier himself, his reporting has taken him all the way to Antarctica.

THE NOBEL PRIZE'S NOT-SO-NOBLE SIDE

by Mark Jackson



When physicist Richard Feynman was asked which now-deceased person from history he would most like to speak with, and what he would say, he said, "My father. I would tell him that I won the Nobel Prize."

No one would deny that winning a Nobel Prize is a big deal. But its 113-year history has been both controversial and colorful.

THREE'S A CROWD

The story behind the Nobel Prize is this: Alfred Nobel was a Swedish chemist and engineer who made a great deal of money by inventing dynamite. In his 1895 will, Nobel stated that most of his fortune should be used to create a fund. Money from this fund would go toward awarding five annual prizes "to those who, during the preceding year, shall have conferred the greatest benefit on mankind." Prizes in physics, chemistry, physiology or medicine, literature, and peace were first given out in 1901; a prize for economics was added in 1969.

The Nobel Prize is so famous that it's sometimes used to describe other prizes. An award called the Fields Medal is informally known as the "Nobel Prize of Math." The Milner Fundamental Physics Prize has been called the "Russian Nobel." The Wolf Prize is called the "Pre-Nobel" prize, because so many winners have later won the Nobel. And then there's the Ig Nobel, an American parody of the Nobel. This prize is given to "honor achievements that first make people laugh, and then make them think." (See "Don't Ignore the Ig Nobel" on page 14.)

Don't Ignore the Ig Nobel

Every year scientists and enthusiasts gather in Cambridge, Massachusetts, for a celebration of the weirder side of science. Winners of last year's Ig Nobel Prizes included scientists who'd studied the effects of opera music on mouse heart transplants (top) and others who'd found that dung beetles can use the Milky Way to navigate (bottom). Another prize went to researchers who studied the probability that cows who are currently lying down will stand up (and vice versa). Then there were the scientists who boiled a shrew and had someone swallow it whole—please don't ask what happened next.

Silliness is not the only goal of the Ig Nobel ceremony, though. The awards, given out by the magazine *Annals of Improbable Research*, are for "research that makes people laugh and then think." The dung beetle study, for example, taught us about the impressive navigational skills of these lowly insects. The boiled shrew taught us about the workings of the human digestive system—but seriously, don't ask.

At the awards ceremony, real Nobel laureates hand out the Ig Nobels. Maybe they even feel a little envious of the winners. There are no costumes, after all, at the Nobel ceremony in Sweden.

—E.P.

But there have been quite a few controversies in the prize's history (even if we ignore the peace prize, which is often controversial for political reasons). For instance, half of the 2008 Nobel Prize in Physics was awarded to Makoto Kobayashi and Toshihide Maskawa for their research, which predicted that at least three families of quarks (certain particles smaller than atoms) existed in nature. Many people, though, felt that Italian physicist Nicola Cabibbo also deserved the award. His research on two quark families laid the foundation for Kobayashi and Maskawa.

Problems like this happen because of a rule that says the prize can't be awarded to more than three people. In 1965, the physics prize went to Sin-Itiro Tomonaga, Julian Schwinger, and Richard Feynman for their work in a field called quantum electrodynamics—but not to Freeman Dyson, the researcher who had used math to show that their three techniques were equally good.

People expected that there would be a similar problem when physicists developed "quantum chromodynamics" (a very large name for a field of science involving very small particles). This new science was based on research articles by David Gross, David Politzer, and Frank Wilczek, as well as a lecture series by Gerard 't Hooft—one person too many to share the prize. Fortunately, 't Hooft won the prize for another piece of work in 1999, allowing the other three scientists to share the Nobel in 2004.

THE NO-BELL PRIZE

The committee that gives out the Nobel Prize also has an unfortunate history of ignoring women's achievements. Columbia University researcher Chien-Shiung Wu did experiments on radioactive atoms that showed predictions made by her colleagues were right. Those colleagues, Chen Ning Yang and Tsung-Dao Lee, won the 1957 Nobel Prize in Physics, though Wu herself did not receive it.

Rosalind Franklin was a biophysicist whose x-ray images of DNA helped prove that its shape is a double helix. This discovery won

Jocelyn Bell Burnell (left) and Chien-Shiung Wu (right) were both left out while their male colleagues won Nobel Prizes.

Francis Crick, James Watson, and Maurice Wilkins the Nobel Prize in Physiology or Medicine in 1962. But Franklin herself was never even nominated for the prize; she tragically died at age 37 of ovarian cancer.

And Jocelyn Bell Burnell did not share in the 1974 Nobel Prize for the first observation of stars called radio pulsars, despite the fact that she was the one who had actually observed them. She shared the observations with her research advisor, Antony Hewish—and he was the one who received the prize. The astronomy community often refers to that year's award as the "No-Bell" prize, in protest.

The seriousness of the prize has also led to a number of myths around it. The most popular one is that there is no mathematics prize because Alfred Nobel's wife (or mistress) was secretly involved with a Swedish mathematician. This is not true. But here is a true story: when Andre Geim found out that he'd won the 2010 physics prize, he replied, "The Nobel Prize has interrupted my work. I'm not sure it is a useful interruption, though it certainly is a pleasant one."

A Nobel Prize is recognition that a scientist has accomplished great things. But, ironically, scientists often accomplish less after they receive the prize. This is probably because the winners (called "laureates") are flooded with requests to give talks and attend social events. Once they've won a Nobel, these researchers are seen not just as great scientists, but as people with wisdom to share.

French biochemist André Lwoff was the winner of the 1965 physiology or medicine prize. Speaking for his colleagues, he observed:

> *We have gone from zero to the condition of movie stars. We have been submitted to what may be called an ordeal. We are not used to this sort of public life which has made it impossible for us to go on with our work . . . Our lives are completely upset . . . When you have organized your life for your work and then such a thing happens to you, you discover that you are faced with fantastic new responsibilities, new duties.*

James Watson and Francis Crick (above) won the Nobel Prize in Physiology or Medicine in 1962. But Rosalind Franklin (center) was never nominated for the prize, although her work helped Watson and Crick discover the shape of DNA. Linus Pauling (below) didn't let winning a Nobel Prize stop him from protesting at the White House.

Richard Feynman, an American theoretical physicist, claimed in his memoirs that he was almost afraid of winning because he might never again do any important work. In reality, though, he made many notable accomplishments after winning the Nobel in 1965.

The most bizarre post-Nobel career has to be that of Brian Josephson, who shared the 1973 physics prize for his work on electrical currents. After winning the Nobel, Josephson began studying a practice called transcendental meditation. He tried to find common ground between meditation and quantum physics. He is now the director of the Mind-Matter Unification Project at Cambridge University. There, he's working hard to research telepathy and other paranormal subjects.

The Nobel's combination of science and politics can create unusual relationships. Linus Pauling is the only person to have won two unshared Nobel Prizes—chemistry in 1954 and peace in 1962. Following the peace prize, Pauling was invited to a dinner at the White House with President John F. Kennedy in honor of all the nation's Nobel Prize winners. Pauling attended the dinner, despite the fact that just hours before, he had been picketing the White House to protest the government's policies on testing nuclear weapons in the atmosphere.

Kennedy greeted Pauling with a joke: "I understand you've been around the White House a couple of days already." Pauling grinned and answered yes. Kennedy added, "I hope you will continue to express your feelings." The two men shook hands.

Mark Jackson is a theoretical physicist at the Paris Center for Cosmological Physics. He originally published a version of this article at the website The Conversation.

THE CONVERSATION

art by Slug Signorino

Q&A

by Lizzie Wade

Q: Why are the skins of witches in kids' stories supposedly green? Why not pink or yellow?

—Sam A., age 11, Oregon

A: The first witch shown with vibrant green skin is also the most famous: the Wicked Witch of the West from *The Wizard of Oz*. The movie, that is. In L. Frank Baum's book, her skin isn't any special color. But the filmmakers added color to a lot of things that didn't pop as brightly in the original story: Dorothy's silver shoes became ruby slippers; horses in the Emerald City gained the ability to change color on a whim; and, of course, the Wicked Witch took on her green hue. All the better to highlight the difference between drab, black-and-white Kansas and fantastical Oz (filmed with a new technology called Technicolor) on the movie screen.

Still, the filmmakers could have chosen any color for the witch's skin. She could have been blue, or purple, or even hot pink. Why green? That's what I asked Deanna Petherbridge, an artist and writer who put together a museum exhibit called *Witches and Wicked Bodies*, which will open at the British Museum in London this fall. "The association of witches with 'greenness' is very ancient," she told me. It goes back at least to ancient Rome. The poet Ovid described Invidia, the embodiment of envy, as having some pale, greenish features and poison dripping from her mouth. Many of Invidia's characteristics, including her connection to the color green, later became part of European and American representations of the witch as a hideous old hag.

In this context, a green tint also reminds of us of dead bodies, says Laura Stokes, a historian at Stanford University who studies how women accused of witchcraft were treated in the Middle Ages. When a dead body starts to decompose, its skin takes on a greenish tinge—think of Frankenstein's monster, she says, who stays green even after he's brought back to life. What better color to be associated with a scary, deadly, unnatural witch?

But there's another side to the witch, and to the color green, Petherbridge told me. Sure, some witches are depicted as ugly and frightening—but others are stunningly beautiful. Beauty makes us think of fertility, which reminds us of nature and brings us back to green. Petherbridge calls this link to both life and death the "double stereotype" of the witch. Eventually, as the witch became confined mostly to children's stories, her opposite sides were split into two characters: the good witch and the bad witch. Most famously appearing, of course, in *The Wizard of Oz*.

—*Lizzie*

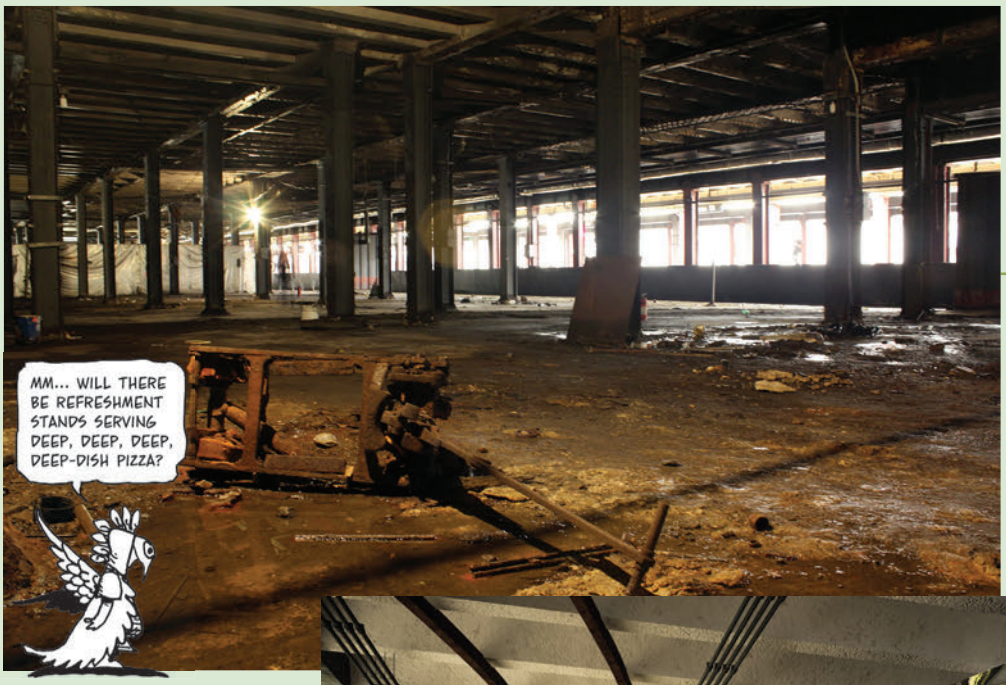
Have any questions you want answered?
Send them to *Muse* Q&A, 70 E. Lake St., Suite 800, Chicago, IL 60601, or send them by email to muse@musemagkids.com.

Forecast: Sunny Underground

by Meg Moss

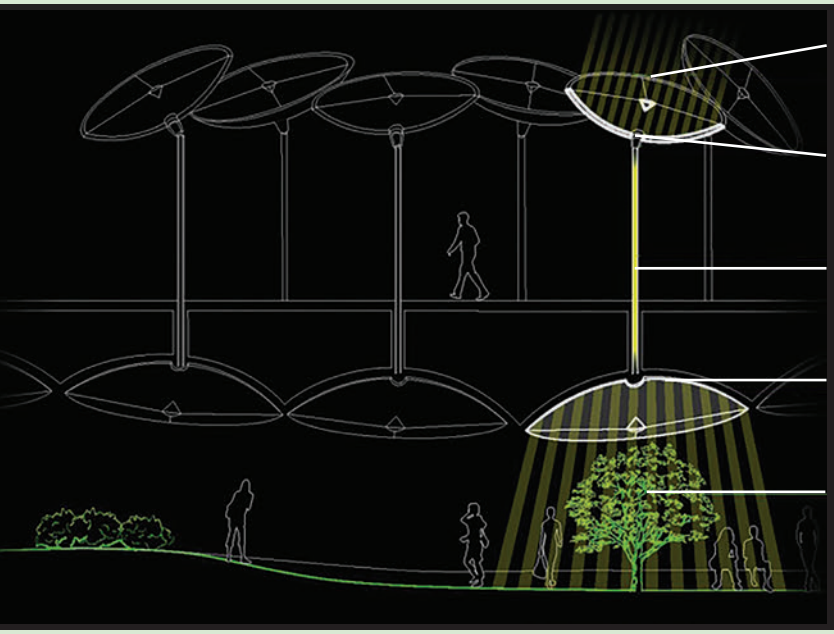
What's under New York City? Subways and sewers, sure—but a park?

Big plans are underway for an old underground trolley station on Manhattan's Lower East Side. Between 1908 and 1948, trolleys hauling commuters to and from Brooklyn converged there on eight tracks. The site, beneath Delancey Street, has been abandoned for over 60 years. But now the station is coming back to life as a park. It will have trees, grass, cafés—and sunlight. An innovative solar array has been designed to let the light shine into the subterranean darkness. Lowline Park is still in the planning stages, but its developers are working hard to make it a reality soon.



It takes a lot of imagination to picture a park in the dank and dirty, 60,000-square-foot (6,000-square-meter) Delancey Street trolley station.

But, as this rendering shows, the architects and designers behind the Lowline project are full of ideas.



solar collection dish
reflective surface gathers sunlight

tracking mechanism
follows the path of the sun throughout the year

helio tube
fiber-optic cables channel sunlight down through the street

dome
reflects and spreads channeled sunlight

green space
underground sunlight lets plants, trees, and grass grow

Key to the success of Lowline Park is the plan to pipe sunlight into the space. Above-ground solar collectors will gather light into fiber-optic "helio" tubes that channel it under-ground. There, reflectors in ceiling domes will distribute the light to where it's needed.

To show how the solar arrays will work, designers installed a test collector in an abandoned underground warehouse. In this demonstration exhibit, sunlight falls on a live Japanese maple tree, grasses, and other plants 20 feet (6 meters) below ground.

Come rain, shine, or even snow, Lowline Park will provide a year-round, subterranean refuge from the hustle and bustle of the city.

Par Sublime

by Année R.

Things looked bleak on hole eight. It was a 450-yard monster with curving hills hiding the little white flag I was supposed to reach in five strokes. A noisy power plant next to the course did not make circumstances any better. I groaned and watched as the first girl in my group drove a ball straight down the fairway.

As a member of Linden Hall School's newly minted golf team, it was my duty to play in tournaments, both to polish the skills I had learned over seven years of practice and to somehow make my school look good. So far it had not been easy to do either. Double pars on holes one through four, double bogeys on five and six, and a strange incident on hole seven where a sinister ravine kidnapped my ball had my confidence level on empty.

The second girl up strode to the tee box, set up her ball, and without even trying punched a drive 150 yards across the fairway.

The last of my confidence flew away like the ducks the girl had startled. There was no way I could shoot even half that distance, judging by my previous performances. She walked off the tee box and told me brightly, "You're up."

I glanced at the girl's shot. I pulled my driver from my bag and slowly trudged up to the tee box. I knelt down, pushed my tee into the soft turf, and aligned my ball to the middle of the fairway. I stood up. My hyperactive brain started feeding me poisonous thoughts: *You're in eighth grade, and these two girls are in high school. Your drives are terrible. You're on hole eight. What makes you think you'll ever finish all eighteen? Pull your head up and your ball will go five yards, and what's Coach going to say when you pull your head up AGAIN?*

At this point reason kicked in. *All you have to do is keep your head down; it's going to be OK. Don't think. Just do.*

I took a deep breath. I went through my pre-shot routine. And then I swung. I didn't think; I just kept my head down the entire time. Out of the corner of my eye I saw a perfect arc slice the still air around it. The metallic click of the driver contacting the ball sounded clean. I corkscrewed my body into a follow-through, keeping my head down for as long as possible.

My head still hadn't come up when the first girl said, "Good job." I smiled at her and thanked her.

"Thanks, it probably wasn't great."

"No, seriously, good job."

"Muserology" is a column written by—and about—a *Muse* reader. Want to see your story here? Send it to muse@musemagkids.com, or go to musemagkids.com/muserology for more details.

How to Speak Golf

Each hole on a golf course has a **par**—the number of strokes (hits) it should take to get the ball in the hole. If par is three, but it takes you four strokes to sink the ball, your score is "one over par." Six would be "double par." But it's better to be under par than over. Whatever your score, make sure to use the right nickname:

bogey	one over par
birdie	one under par
eagle	two under par
albatross	three under par
condor	four under par
ace	a hole-in-one

—*E.P.*

I looked up. My ball had gone over 180 yards, dead center on the fairway. It had gone farther than I think it had ever gone before.

"Oh. Wow, thank you," I told the girl.

As I walked to my ball, I thought, *Yeah, that was good, but it won't last very long. Next stroke will go three feet.*

It didn't. It went 153 yards. And so did the next one, which landed on the green. The white flag came down as I brought my ball a few inches from the hole on stroke four. On stroke five my ball sank into the hole with a satisfying plop.

"Nice par," said one of the girls.

"Thank you," I said, hardly able to contain my excitement.

As I heaved my bag onto my shoulders and marched to hole nine, I was ecstatic. I had thought that hole would be a complete failure. My game was finally picking up. I could pull out a decent score after all!

From that point on I played terribly. I had a final score of 118 strokes on 18 holes.

But I'm proud of that day, no matter how badly I played the rest of the round. I didn't just seize the goal of making par; I also faced a fear—the fear of failure. I was terrified of long holes because they left too much chance for a crippling score. When I forgot about the length of the hole and focused on what I could change—my attitude, my technique—I did better than I thought I ever would.

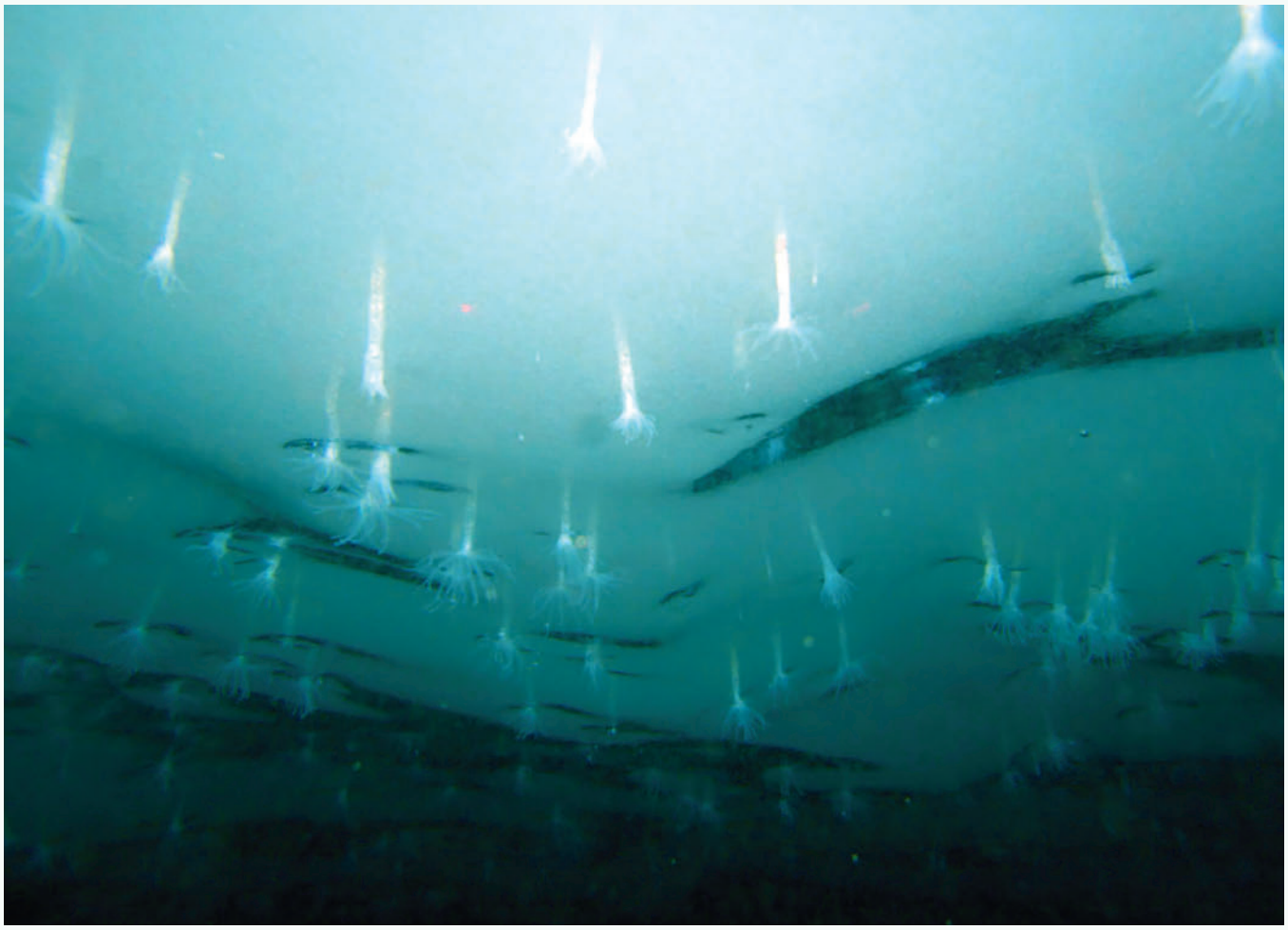
I just wish the ducks had stuck around to see it.

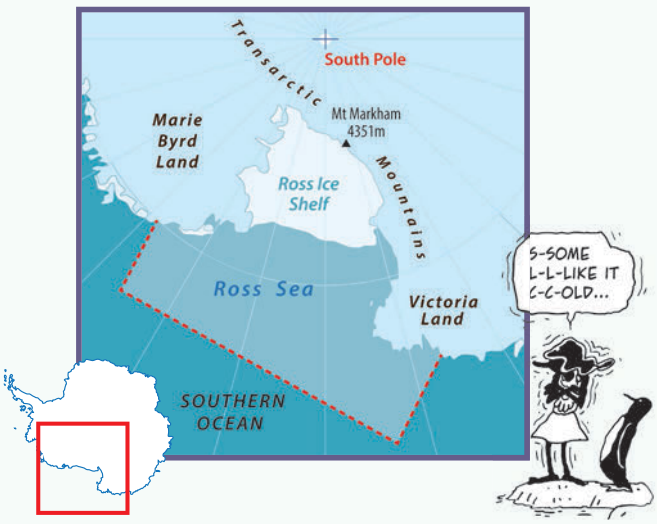
Année R. is a 14-year-old Muse *reader in Pennsylvania. Her name is pronounced "uh-NAY," as in "Gimme an A!"—which is what we'll be cheering at her next tournament, whether or not she makes par.*

Anemones on Ice

At the bottom of the world, scientists have discovered a weird new sea creature that hangs beneath pieces of floating ice.

by Jane J. Lee





A Lucky Accident

Where else would a species that spends its life upside-down live but in the Southern Hemisphere? The newly discovered Antarctic sea anemone dwells in burrows dug into the bottom of sea ice in the Ross Sea. There it lives a mysterious existence.

The discoverers are unsure of what it eats or how it reproduces. They don't even know how the anemone—an opaque white creature with a stringy body topped by delicate-looking tentacles—digs its burrows. But they are sure that it's a species no one has ever seen before. They shared their findings with the world in a study published in December 2013.

The study authors write that the new species is the first anemone found living in sea ice, rather than stuck to hard surfaces like rocks or reefs. The finding is a reminder of how hardy and surprising life can be, even under the frigid ice shelves of Antarctica.

Discovery of the new anemone, named *Edwardsiella andrillae*, happened by accident. Frank Rack, a marine geologist at the University of Nebraska–Lincoln, is one of the study's authors. He says the team stumbled across the anemone while they were testing out underwater equipment, including a robotic explorer called a remotely operated vehicle (ROV).

The ROV that Rack and his colleagues wanted to test can travel 984 feet (300 meters) deep. It had traveled through ice a couple of meters thick before, says Rack, but the area they were in had ice up to 853 feet (260 meters) thick. The ROV pilots wanted to make sure the vehicle still worked correctly when it was in water underneath that much ice, before Rack and his colleagues used it for a future seafloor-drilling project.

That's when the discovery came.

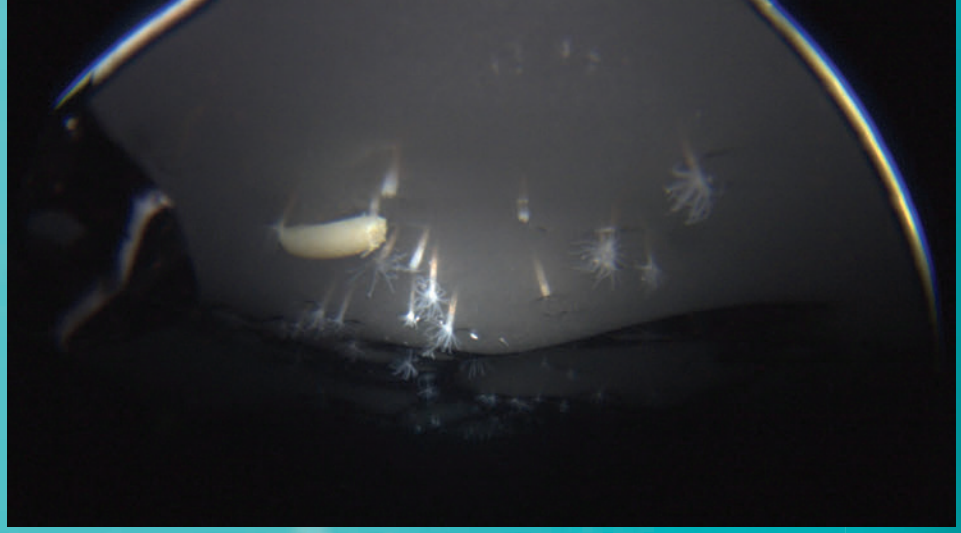
Fuzzy Ice

Earlier, when the scientists dropped a camera on a rope down a hole they'd drilled through the ice, they'd seen a "flat, uninteresting" surface, Rack says. "But when we went down with the ROV and its camera systems, the [underside of the] ice looked fuzzy."

Upon closer inspection, the researchers noticed tentacles sticking out of the ice. "As the [ROV] approached the anemones, they would pull back into their hole," Rack recalls. "It was amazing."

Although Rack and his colleagues aren't biologists, "we knew what we had stumbled on, and it was very cool," Rack says.

Because of bad weather, the staff at Antarctica's nearby McMurdo Station weren't able to



Left: a group of upside-down anemones hang from the ice. The blobby whitish thing is a mystery creature that scientists nicknamed the "egg roll." Right: a close-up view of an *Edwardsiella andrillae* anemone (the tentacles are at the top).

send collecting supplies out to the ROV testing group. But the team managed to build an improvised vacuum tube using a spare ROV thruster and a coffee filter. With this, they sucked up 20 to 30 anemones.

Many of the animals clung tight to their frigid homes, so researchers had to stun them with some warm water before they could grab the invertebrates.

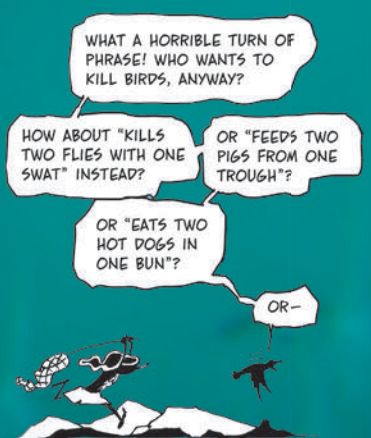
The team wasn't able to preserve the animals in a way that would let other scientists study their DNA. But with sea anemones, DNA doesn't always give a definite answer about a species, Rack says. "The taxonomy [or set of physical features] is what's really needed for species identification."

The opaque anemones were less than an inch long. And they appeared to glow an orange color when the ROV's lights shone on them, says Rack. He doesn't know whether that glow comes from the food the animals eat, or if the anemones themselves are generating it.

A New Perspective

The pilots were able to collect their samples and observe all these details while flying their ROV upside down. Normally used to explore the seafloor, the underwater robot has two cameras—one that faces down and a second one that faces forward.

The only way to take pictures of the anemones, along with other organisms on the underside of the ice such as small crustaceans and fish that swim upside down, was to fly the vehicle with its cameras pointing at the bottom of the sea ice.



Rack and his colleagues are now working to get funding from the U.S. National Science Foundation that will let them go back to Antarctica, this time with a group of biologists. Rack hopes to kill two birds with one stone. While completing his seafloor drilling project, which will tell him about the history of the planet, he'll also gather more information about this mysterious new species of sea anemone.

Jane J. Lee is a news writer and editor at National Geographic. *Unlike the Antarctic anemones, she spends most of her time right side up.*

Lemur Bellies You Should Know

by Elizabeth Preston

Right now, some of the world's fluffiest and most interesting bellies are swinging between tree branches in the forests of Madagascar. This island, off the eastern coast of Africa, holds all the wild lemurs on Earth. There are more than 80 types of lemur, and they all have bellies and bodies specially adapted to their own lifestyles.

Outside of Madagascar, the largest lemur population is at the Duke Lemur Center in North Carolina. More than 250 of the primates (which are an older relative of monkeys and apes) live here. A few of them agreed to model their furry tummies for us. But please, no nuzzling.

Along with its plush tummy, this species—called a fat-tailed dwarf lemur—has a chunky tail where it stores fat to help it hibernate in winter.

Ring-Tailed Lemur

This lemur is not practicing yoga. It's just using its belly to soak up some sun, says Chris Smith, an education specialist at the Duke Lemur Center.

Ring-tailed lemurs live in a dry, desert region of Madagascar, where food can be scarce. Daily sunbathing lets them use the sun's energy to warm their bodies, so they can conserve their own energy for tasks like searching for food. Although some other lemurs sunbathe too, Smith says, ring-tails are the only ones that strike this distinctive pose to do it. And baby lemurs have to practice balancing upright like their parents, he says. At first, "They fall over, and then they prop themselves back up, and then they fall the other way."

Pygmy Slow Loris

Not actually from Madagascar, lorises are lemur cousins that live in Southeast Asia. Pygmy slow lorises like this one are almost supernaturally adorable: they fit in the palm of your hand, have enormous cartoon eyes, and seem to move in slow motion.

But their extreme cuteness has gotten these little primates in trouble. They're YouTube stars; videos of pet lorises munching grapes or holding tiny umbrellas have inspired people to try buying lorises of their own. However, Smith says, "There's really no such thing as a legal pet loris."

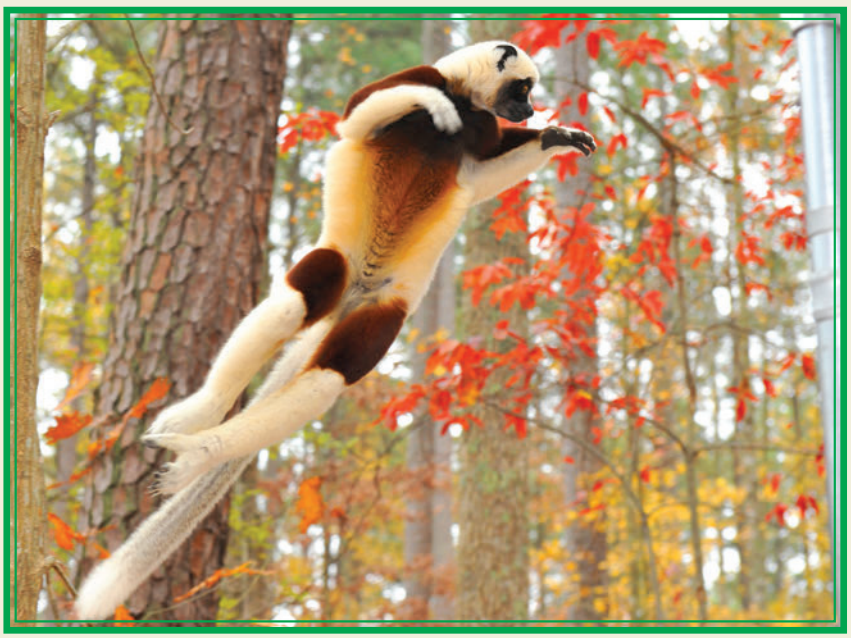
All species of loris are endangered in their home countries, and most pet lorises have been illegally stolen from the forests where they live. They may look sweet onscreen, but their big eyes, adapted for night vision, are straining against the daylight, and their cute behaviors are really attempts to protect themselves. Some pet lorises have even had their teeth pulled out so they can't hurt humans with their toxic bite.

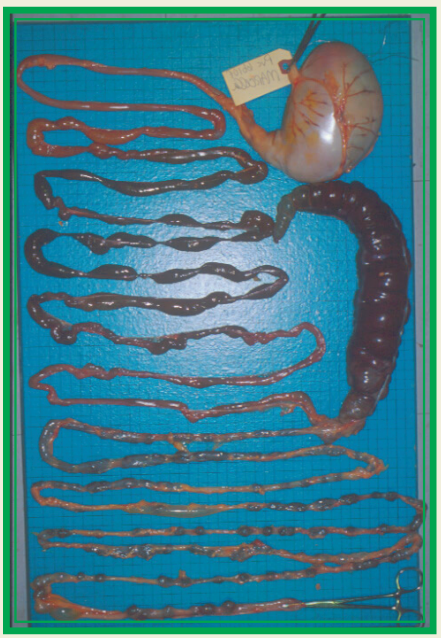
Red-Ruffed Lemur

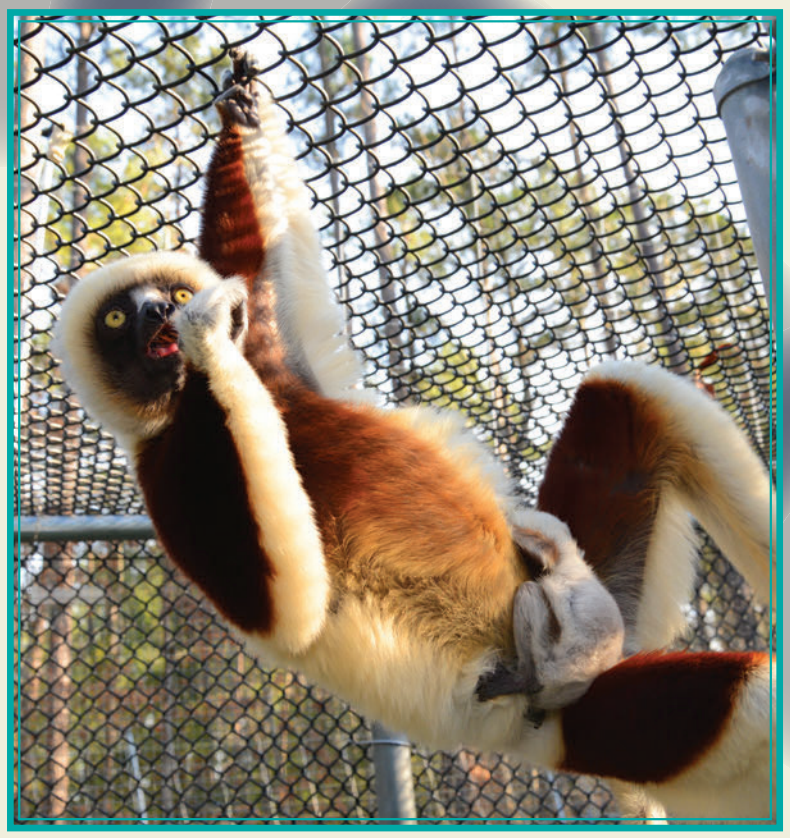
The inside of a lemur's belly can tell a story about how it lives. The red-ruffed lemur, for example, has a short and simple digestive tract (above). That's because its diet is almost entirely fruit. This species poops almost every four hours, leaving behind undigested fruit seeds wherever it goes. Gross—but important for growing new trees in the forest.

Coquerel's Sifaka

Unlike a red-ruffed lemur, a Coquerel's sifaka has a very long digestive system packed and coiled inside its belly (below). This is because the sifaka (pronounced "shuh-FAHK") lives in a less rainy part of the island. Instead of tasty, nutritious fruit, it's stuck eating leaves. Its long intestine works slowly, squeezing every last bit of nutrition from this meager diet.







Aye-Aye and Other Babies

The least cuddly belly at the lemur center belongs to the aye-aye, an animal that looks closer to an alien than a primate. This one (top) is a baby, but as an adult it will still have bulging eyes, bat ears, and extra-long middle fingers that it uses to scoop grubs out of hollow branches.

Cute or not, every last baby lemur is important, says Smith. Lemurs are the most endangered mammals on Earth. Aye-ayes and Coquerel's sifakas are two of the species the lemur center focuses most on breeding. When the center's baby lemurs grow up, they may be sent to zoos and other facilities around the country, or even internationally. This helps ensure that captive lemur populations around the world have a healthy mix of genes, so their species can stay strong.

You'll often see baby lemurs clinging to their moms' bellies. This can be quite a feat—Coquerel's sifakas like this one (bottom) are natural acrobats and can leap as far as 30 feet (9 meters). Nevertheless, the babies, just like their species, keep hanging on.

Is your pet's belly as cute as a lemur's? Send a tummy-tastic photo to muse@musemagkids.com, then go to musemagkids.com/townhall to see a gallery of readers' pets!

WHEN ANIMALS STEA

by Dan Riskin

art by Vikki Chu

NATURE DOESN'T ALWAYS PLAY NICE.

It might seem impossible that animals can steal from one another. After all, animals don't have money or laws about property.

But try telling that to a cheetah who does all the work to sneak up on, chase, catch, and kill a gazelle, only to see hyenas take the carcass away. Since the cheetah has put time and energy into getting that carcass, biologists think it's fair to call it "theft" when it's taken away.

Some animals are more vulnerable to theft than others. Animals that swallow their food immediately, like snakes and frogs, don't have much of a problem with other creatures stealing their calories before they're eaten. But lots of animals need time to ingest their food after it's captured. Cheetahs are great examples of this, and so are ants.

ANTS ABSCOND

Leptothorax ants live in colonies of a few hundred individuals. For those colonies to work, they need a food transportation system.

First, workers swallow the food. Then they return to the nest and regurgitate that food to feed the growing larvae. Some of the larvae will grow up to be workers themselves, while others become soldiers that defend the colony. At the center of it all is a single queen—she's the only ant who can reproduce and the mother of all new ants born into the colony. Every other ant in the colony works for her survival.

Because a *Leptothorax* ant colony is large and complex, it takes time for the colony to process food. That makes it possible for thieves to take advantage of them.

One such thief is the queen of a different species of ant, called *Epimyrma* (the Latin name means "above ant"). She sneaks silently into the *Leptothorax* nest like a burglar. When the first *Leptothorax* guards attack her, she dodges them like a stealth ninja, then stings them with just enough venom to stun them. She doesn't kill them because they're still useful to her.

Next she takes substances from the surfaces of the *Leptothorax* ants' bodies and rubs them all over herself, to cover up her own scent. Once that's done, she can move through the colony without being noticed. Because she smells like a *Leptothorax* ant, the members of the colony can't identify her as an intruder. Wearing this disguise, the invading female finds her way to the *Leptothorax* queen's chamber. There she approaches the unguarded queen and murders her.

With the old queen dead, the *Epimyrma* queen takes her place as the new leader of the *Leptothorax* colony. She lays her own eggs, then lets the workers of the colony take care of her and feed her offspring, unaware that they've been enslaved. In doing this, she's not just stealing food from the *Leptothorax* colony. She's stealing the colony itself.

At least 200 different kinds of ants steal like this. However, not all ants do their stealing the same way.

For instance, the ant *Polyergus* will go on "slave raids" in which roughly 1,500 individuals move together to attack the colony of an ant called *Formica*. The invading ants capture as many *Formica* larvae as they can find, then bring them back to their own colony. When the *Formica* larvae grow into adults inside the *Polyergus* colony, they just start working. They have no idea that they aren't where they belong.

The strangest part of the story is that *Polyergus* ants have become so dependent on their slaves that they can't live without them. *Polyergus* colonies always have *Formica* ants in them. Without slaves to do the work, *Polyergus* ants can't survive.

An *Epimyrma* queen goes on a violent mission to dethrone a queen *Leptothorax* and seize control of her colony.

A mooching *Argyrodes* steals an orb weaver's meal.

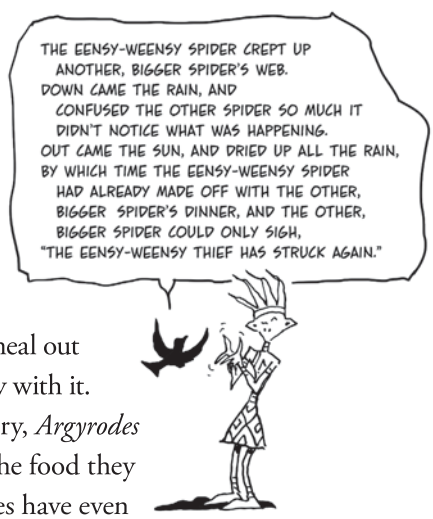
SPIDERS STEAL

Unlike ants, spiders usually live alone. But their habit of storing food before eating it makes them vulnerable to theft too.

An orb-weaving spider, for example, eats its food slowly. The spider spins a web and sits at the center, waiting for the vibrations that happen when an insect gets tangled up. When it senses those vibrations, the spider heads over to the struggling insect, wraps it in silk, stabs it with venom, and leaves the insect hanging so that it can continue hunting. As the spider heads back to its perch at the center of the web, the insect lies helplessly tied up while venom digests its internal organs. Later, when the spider wants to get out the calories, it can go back to the now-dead insect and slurp out the liquefied insides like a smoothie.

The spider *Argyrodes* could do all that work for itself too, but it chooses not to. Instead, it hangs out on the edges of an orb-weaving spider's web. Orb weavers are impressively large, around two inches (five centimeters) long, while *Argyrodes* spiders are only a quarter to half that size. Sometimes, when a small insect gets tangled in the orb weaver's web, the *Argyrodes* spider runs over and steals it before the orb weaver gets to it. That's usually not a big problem for the orb weaver, since the stolen insects are so small that it probably would have just ignored them anyway.

But sometimes *Argyrodes* goes for larger prey. When a nice, big, juicy insect hits the web, the orb weaver stuns it and injects it with venom as usual. The *Argyrodes* spider knows when the capture happens by feeling the vibrations in the web. Then it waits for the large spider to get distracted by new prey. Once the orb weaver heads off to wrap up that second insect, the *Argyrodes* spider scurries in, cuts the original meal out of the web, and runs away with it.



To add insult to injury, *Argyrodes* spiders don't always eat the food they steal. In some cases, males have even been seen giving stolen food away to females as gifts, to avoid getting eaten during mating.

When *Argyrodes* spiders steal from other spiders, their strategy is to never get too close. But a spider called *Curimagua* has no worries about walking up to a creature 30 times its size and stealing food right out of its mouth.

Even though they're only about a millimeter long, *Curimagua* spiders do their thieving from a spider 1.5 inches (3.8 centimeters) long, called *Diplura*. Those larger spiders build funnel-shaped webs. When a large prey animal—such as a grasshopper, beetle, or even frog—walks near the opening of the funnel-web, the *Diplura* launches out. It strikes with its fangs, then drags its prey back to the opening of the funnel to suck its insides out.

As the big *Diplura* spider starts feeding, the *Curimagua* spider walks right over to its mouth and starts eating alongside it. In fact, the tiny thief can apparently walk anywhere

it wants to—in the funnel-web, or even across the *Diplura* spider's eyes. The larger spider doesn't seem to pay any attention to it. This may be because *Curimagua* is so small that the calories it steals cost *Diplura* less than the calories it would have to spend catching and killing the intruder.

It's a strategy that works so well for the small spider that it has lost its ability to live anywhere else. Unlike other thief spiders (like *Argyrodes*) that can make webs and catch their own prey whenever they need to, the *Curimagua* spider can no longer hunt for itself. It may be the only spider species in the world, out of more than 43,000, that doesn't do its own hunting.

Another unique spider thief is a very special jumping spider called *Bagheera kiplingi*. (That Latin name will stick in your brain if you've ever read Rudyard Kipling's *The Jungle Book* and you remember Bagheera, the black panther.) *Bagheera kiplingi* is the only known vegetarian spider in the world. It lives on acacia plants, eating the nectar that the plant makes for ants (in exchange, the ants protect the acacia by attacking any animals that try to eat the plant). As you can imagine, having a spider steal "their" nectar doesn't thrill the ants. So the spider has to constantly hide from them, jump out of the way when attacked, or else hang from a thread so no ant can reach it.

The spider isn't a *strict* vegetarian—it dines on larval ants from time to time, so it's technically also a predator of the ants. But *Bagheera* gets almost all of its food by stealing nectar from ants, rather than by killing them.

PREDATORS PILFER

It's not just creepy-crawlies that deal with theft. It's a problem for big animals too. Many African predators, for example, add to the food they kill themselves with food they steal from other predators. Hyenas

are famous for stealing from lions, but things aren't as one-sided as *The Lion King* might have led you to believe. Lions are aggressive carcass thieves too. Hyenas often hunt and kill their own food only to have it stolen by a pride of lions.

Theft is more than a nuisance for these animals: it threatens their survival. Kills don't happen every day, so predators sometimes go several days without food. That's why having a meal stolen can create big problems, especially right after an animal burns a whole bunch of calories running down and killing its prey.

A cheetah, for example, will hide its food as quickly as possible after a kill. But a cheetah is smaller than other kinds of predators, so as soon as competing carnivores find that carcass, the cheetah has to leave. This means even with plenty of prey to feed on, cheetahs may not be able to hunt in certain habitats because of competition with other predators. In fact, if a cheetah so much as hears the calls

Even the fastest animal on land can't escape thieves.

of hyenas and lions, it will stop hunting and move to another location—probably to save itself the trouble of having its food taken away.

Similarly, African wild dogs are endangered, with fewer than 6,000 individuals left. So nature reserves have been set aside to protect them and other endangered animals where they live. But because hyenas and lions thrive in those same reserves, the African wild dogs can't seem to catch a break. One study in Zimbabwe showed that African wild dogs inside a park had their food stolen roughly twice as often as they did outside the park. As a result, they chose to spend most of their time outside the protected area that had been set aside for them.

It's nice to imagine that nature is perfectly balanced and can keep itself in check. If humans just took themselves out of the picture, things would come to their natural order—right? Actually, the truth is that non-human animals have no idea of order. They simply do their best to thrive as individuals. If animals in an ecosystem are left alone for long enough, a balance does emerge. But when that balance is thrown off, the original order may never return. Some new order might form instead, and some of the original animals might simply not be a part of it.

For example, if we stopped hunting or making wildlife reserves in the savannahs of Africa, it's not necessarily true that cheetahs or wild dogs would be able to bounce back. It was humans that brought their numbers down in the first place. But even if humans vanished now, the problem of theft by other animals—or perhaps something else altogether—might prevent the cheetah or wild dog populations from ever recovering. The balance might already be lost forever.

PEOPLE PURLOIN

Theft by the meat eaters of the African savannahs has special importance to humans because we

Think we're above it all? Stealing may be human nature.

evolved as a species among them. If we could travel far enough back in time, we'd see lions and hyenas stealing food from other predators—but they'd also be battling with a third species for those carcasses, and that third species would be us.

To early humans looking for meat, chasing some lions away from a wildebeest carcass would have been dangerous. But it would have been a more appealing strategy than the alternative of hunting the wildebeest themselves. For early humans, that second option might mean chasing the animal on foot for eight hours or more in the searing midday sun—a technique called "persistence hunting."

In the 1980s, researchers spent a year living among a group of around 50 Hadza people (hunter-gatherers who live in eastern Africa). The researchers found that the tribe did use persistence hunting. But they also saw that members of the tribe always paid close attention to their environment for any signs of a fresh kill by other predators. This might mean circling vultures, or the nighttime calls of hyenas or lions. If they found such a clue, the Hadza men would immediately run in that direction.

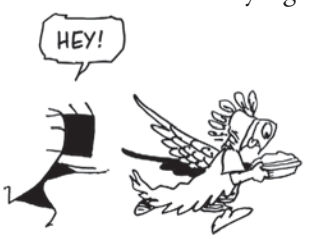
Leopards and hyenas would run away as soon as the people got there, but lions were often stubborn enough to stick around (and ended up becoming part of the human meal). Over that year, 20 percent of all the dead animals brought back to the village had been scavenged from other predators. This included meat from elephants, zebras, warthogs, giraffes, wildebeest, and impala.

Humans who live in a similar way to the Hadza in other parts of Africa, including Cameroon and Uganda, have also been seen stealing meat from predators. These 20th-century

people may use hunting methods similar to the methods our ancestors in Africa used thousands of years ago. If that's the case, theft is probably a big part of humans' history—and a reason for our success as a species.

These days, we frown on theft. But the evidence tells us that humans may have been thieves for almost as long as we've been able to walk on two legs.

Dan Riskin is a Canadian evolutionary biologist and television host. He recently published a book called Mother Nature Is Trying to Kill You.



The Question of Envy

Do animals steal because they're envious? That's a tough question.

It's not *quite* impossible to know whether or not an animal truly experiences envy—but it's pretty close. To prove that animals feel envy, you first have to show that they understand that other animals have their own experiences. Then you have to show that the animal can measure a difference between what it has and what a competitor has. And then, finally, you have to show that this imbalance makes the animal react negatively. That's a lot of careful experiments.

But those experiments have been done with capuchin monkeys, and the results are pretty convincing. Researchers trained some monkeys to put a small rock in a person's hands. As a reward, the monkeys would either get a grape, which they *loved*, or a little cucumber, which they found OK, but less exciting than a grape. To look for envy, the researchers fed monkeys their grapes and cucumbers in side-by-side cages. This meant the monkeys could always see what their neighbors were getting.

So long as the reward a monkey got was the same as the reward its neighbor got, monkeys played along, happily taking grapes or cucumbers in exchange for their work. But if a monkey got a cucumber while it could see its neighbor getting a grape, the monkey got angry. Monkeys would sometimes throw the cucumber back in the face of the researcher, or just stop playing the game altogether. Essentially, monkeys refused to do the work if they saw someone else getting paid more for the same job.

Dogs act the same way. In another study, researchers put pairs of dogs side by side and asked them to "give a paw." The dogs obeyed the order up to 30 times in a row when researchers gave both dogs treats as rewards—or even when the researchers gave neither dog a treat. But if one dog got treats while the other one did not, the dog getting nothing quickly stopped obeying commands.

Dear *Muse*,

It has come to my attention that someone plans to editornap your editors. Unfortunately, because of the circumstances I am in, I cannot tell you who or how, but I can tell you when. On the night of the full moon, Mimi will wake up to a high-pitched scream and faint of fright. In exactly pi minutes, Bo will announce she is starting a line of frozen food products that will make people know as many factoids as she does. In no more than exactly less than half of two-thirds of a fourth of an hour, Urania will tell the Muses that she plans to move to Jupiter, and that Chad has built her a sanctuary there. After two-fifths of a millisecond's friend the philisecond, your editors will be gone, and *Muse* will be controlled by an unknown mastermind who also runs the evil *Dig* magazine's pit of fan mail.

I would like to tell you how I know this, but unfortunately, I cannot, or the mastermind will know who I am and seek his revenge. Thank you. Oh, and Crraw, Aeiou, Kokopelli, and Feather will also disappear two minutes from the time that a million *Muse* readers have finished reading this letter, but will reappear when you have gotten your editors back. Now I must go.

Sincerely,
An unknown Muse of board games and secrets

What an evil plan! It's all so clear . . . and yet somehow not.
—Crraw

Dear *Muse*,

I love Musémon so much that I would appreciate if you put Musémon in every issue of this magazine that ever comes out. I used to play with Pokémon, but Musémon is way better.

Your Musémon- and Percy Jackson–loving fan,
Andrew L., Iowa

P.S. Your magazine is fantastically, fabulously awesome.

P.P.S. I think it is incredibly rude of Kokopelli to throw pies at people.

P.P.P.S. Could you please please please one million times please put something Percy Jackson–related in one of your issues?

Dear *Muse* (and Muses),

I love your magazine. Remember in the November/December issue, on the back, where it usually says "Digital Editions of *Muse* Are Here," there was something else? The next morning before my reading/writing class started I asked my friend Eli if he brought his Pokémon binder. He said, "No." But still, then I unleashed the Musémon. Although he wasn't thrilled about trading his Pikachu for a willow tree, he was interested. After printing some more cards off the Internet, he and I play together at lunch every once in a while.

I'm guessing that the FMP is for "junk" mail. Do you ever get Walmart catalogues or fake Discover cards?

Sincerely,
Matthew N., age 11, Texas

P.S. Urania, you're the only Muse who's Greek. So if everyone else poofs! into nonexistence, don't say I didn't warn you!

The only junk mail we get is junk-FOOD mail, namely the potato-chip-of-the-month club Feather signed us up for.
—Bo

You all complain, and yet every month the chips disappear before I get any . . .
—Feather

Dear *Muse*,

You're the best magazine in the world! I can't get enough! Could you put in one or two pages about rocks? I'm obsessed with them! I either want to be a miner or a geologist when I grow up.

Wishing you best,
Lauren R., age 8, California

I hope you enjoyed all the pages about rocks hurtling through space in our April issue!
—Urania

Dear *Muse*,

I LOVE your magazine x 3.14159! I think you should make an article on pronghorns. If you don't know about pronghorns, let me say this: they are #99 on my list of favorite things (which is only 100 numbers long). The only thing higher is *Muse*. Hot-pink bunnies don't make sense to me. So how about HOT-PINK PRONGHORNS? Mwahahaha!

Nancy S., age 10, Virginia

It's true pronghorns are a lot faster than bunnies, not to mention they have horns and hoofs, which make them unpleasant when they're mad. But they're not nearly as deceitful and scheming as HPBs . . . Of course, if the two ever join forces, we'll really be in trouble.
—Pwt

Dear *Muse*,

I have lately been really into YouTube. I post videos as much as I can. They are about science. I do experiments. Then I explain how they work! It's really fun. Although I only have 15 subscribers. :(However, I have a few questions for the Muses:

Bo: The fake fact in the November/December 2013 issue—how fake is it? I've heard several theories that light exposure induces happiness, so why don't sunglasses prevent it?

Kokopelli: You tend to only use sweet pies when you are throwing them at people. I think a savory pie, like spinach, would be far more offensive.

Urania: Is space (the multiverse) infinite?

Yours truly,
Alice, age 12, New York

P.S. If this goes into the FMP, I'm really good at baking spinach pies . . .

art by Larry Gonick

That's a great question about sunglasses. Why don't you do an experiment and tell us what you find out?
—Bo

I didn't want to hear Urania's answer to your question, so I put a cabbage pie in her face. Thanks for the tip!
—Kokopelli

Dear fellow Musers and fanboys/girls,

Hi. I am Josiah S., a.k.a. Joe the Stickfiddler. I am found in many places across the Internet, including the *Cricket* Chatterbox.

But enough advertising. I am writing to request an article about drones. They are very interesting. And quite a recent subject. Well, not drones themselves. The drones are old news. The plans for commercial use of them are not. Amazon is planning to use them for shipping someday soon.

Also, I have a HypQuest (hypothetical question) for Kokopelli: What would you do if one of your pies came to life and demanded that you eat it and not throw it?

One more thing. It would be awesome if you Musers could maybe do a crossover adventure with the *Cricket* gang? I remember someone writing to *Cricket*'s Letterbox suggesting it. Thanks for your consideration.

Josiah S., a.k.a. Joe the Stickfiddler

Wow! Someone's training male bees to carry packages??
—Pwt

Not the bee kind of drone; the robot kind.
—Chad

Oh. Who cares, then? When bees start making deliveries, I'll be impressed.
—Pwt

Dear *Muse*,

Bonjour! Comment allez-vous aujourd'hui? Je m'appelle Rose. Translation: Hello! How are you today? My name is Rose.

I am a complete fan of MUSTACHES!!!!! I would really like you to do an issue on mustaches. Most people don't know a lot about them. One of my favorite things about your mag is its comics. Please add more!!!!!

I live in America even though my granny, cousins, aunts, and uncles live in Ireland. No, they do not eat potatoes, believe in leprechauns, or hunt for pots of gold! My uncle owns one of the main grocery stores there, and I can tell you there are not a lot of taters!!!! And only my youngest cousins may believe in leprechauns, but that doesn't mean they all do!!

Sincerely,
Rose Margaret J.

P.S. If you do not publish this I will grow 1,000,000,000 genetically modified handlebar mustaches and send them to imprison the editors and take over *Muse* mag!!!!!!!!

You're too late; we've already been editornapped.
—Editors

Good hello to the Muses! I noticed that in your last few issues there have been a number of letters from my fellow Wholockians, and I would like to add my voice to their number. Sherlock lives!

Mkay, I'll stop now. What I really wanted to ask was: could you do an issue on the science of guitars? Like, how they're made, how different pedals affect the sound, how amps work, etc. I personally play bass guitar (a cherry-red Epiphone 2007 EB-0, used) and I would love to learn about the science behind them. Thanks!

Love, sun, and aquariums,
Mahli, age 14, Battery City (totally not Massachusetts)

For some reason I am very interested in the earth's layers. Do you think that you could put an article about all of them in next month's issue? I also wanted to tell you that in one of the last issues, January 2014, when you mentioned Sue the *T. rex* and how she died, it was quite fascinating! After awhile of reading *Muse*, I learned how to look at things from a scientist's point of view. For instance, a few years ago I went to Chicago to see Sue at the Field Museum. As a normal kid I saw the holes in her jaw and thought nothing of it. Now, though, I am bummed that I didn't look closer.

Also, the great thing about *Muse* is the never-ending facts, because in my class we were reading about lab-grown burger! *Muse* had an issue on that about forever ago! I was (for once) the smartest kid in the class! I knew the scientist's name, who tested it, and what it tasted like!

Sincerely,
Gabby R., age 10

Just make sure that if you bring lab-grown burgers into class, you have enough for everybody to share.
—Chad

Aeiou and Chad are my favorite Muses. People have asked about Aeiou's name, and I have noticed that it is the vowels: A, E, I, O, and U. I also noticed that the letters Y and W were not included. (W is sometimes a vowel.) ALSO: here's a sentence with only the vowel Y: Why cry by thy fly? That is a silly sentence, because why would you be crying by a fly that you own, and why would the person asking the question care about the fly?

Ethan, who lives in the United States, where I live

Why? My fly's shy.
—Pwt

Send letters to Muse *Mail, 70 E. Lake Street, Suite 800, Chicago, IL 60601, or send them by email to muse@musemagkids.com.*

MUSE CONTEST

HOAX ON US

After you read about the search for Bigfoot in our February issue, we asked you to fake some evidence for your favorite cryptid. Who needs giant plaster feet when you have Photoshop?

This is a New Jersey Devil tooth.
Alexandra X., age 9, New Jersey

KOKO'S KUDOS

This month's runners-up are **Varun N.**, age 10, California; **Clare and David M.**, California; **Ted L.**, age 12, Ohio; and **Connor B.**, Michigan. You can find their entries and more contests at musemagkids.com/museum.

NEW CONTEST

THE DARK SIDE

A character climbs down to the underside of a glacier—and can't believe what he or she finds there. What happens next? **Write a story of 300 words or less.** Watch out for deadly icicles.

CONTEST RULES

1. Your contest entry must be your very own original work. Ideas and words should not be copied.

2. Be sure to include your name, age, and full address on your entry.

3. Only one entry per person, please.

4. If you want your work returned, enclose a self-addressed, stamped envelope.

5. All entries must be signed by a parent or legal guardian, saying that this is your own work and no help was given. For detailed information about our compliance with the Children's Online Privacy Protection Act, visit the Policy page at cricketmag.com.

6. Your entry must be received by August 31. We will publish winning entries in the January 2015 issue of *Muse*.

7. Send entries to *Muse* Contest, 70 E. Lake St., Suite 800, Chicago, IL 60601 or via email to muse@musemagkids.com. If entering a digital photo or scan, please send at 300 dpi.

Evidence of the Dingonek!!!
Henry N., age 13, France

A three-headed dog was in my backyard. It killed a bird. You can see the feathers, flesh, and the claw marks are there too.

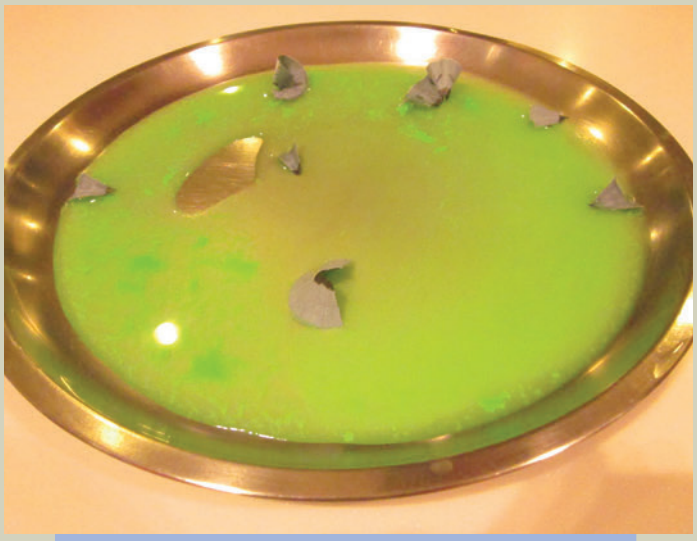
Amy R., age 9, California

AGGGG!!! GIANT MONSTER TURTLE. We found it living in our pond. It seems to like stripping bark from trees and eating it!

Ike and Jed R., ages 11 and 9, California

Even the Yeti makes snow angels.

Clare D., age 10, Montana



Proof of the dribble and tufts of fur from my cryptid.

Tanmay G., age 12, Malaysia

Oh, Heck

For obvious reasons, locals call this site in Turkmenistan the "Door to Hell." The ominously flaming pit is 230 feet (70 meters) across. A professional hockey rink would fit inside with room to spare—though, of course, the ice would melt.

Back in 1971, before it was a hole, Soviet scientists began drilling at this desert site for natural gas. But the ground beneath them suddenly collapsed, releasing a large amount of methane. The scientists decided the safest thing to do was to set fire to the gas and wait for it to burn off. They thought this would take a matter of days.

More than 40 years later, the crater is still burning. It's almost pretty—as long as you stay a safe distance away.

—*E.P.*

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