


SuperScience



Hundreds of sharp teeth help this sea lamprey attach to other fish so it can suck their blood.

LIFE

Real-Life Vampires!

Meet five wild creatures
that feed on blood

Watch a **VIDEO** about the eruption that buried the ancient city of Pompeii!

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ON THE COVER: Read about sea lampreys, and other bloodsucking creatures, on page 10!

COVER: SHUTTERSTOCK.COM (LAMPREY); ILLUSTRATION BY SHEN FEI (POMPEII)



EARTH SCIENCE

HUBBLE PICS

The above photo shows giant clouds of dust and gas where stars form. The image was taken by the Hubble Space Telescope.



Earlier this year, the Hubble Space Telescope, a powerful instrument circling Earth, reached a big milestone. It turned 30! To celebrate, the U.S. space agency NASA released this stunning image recently taken by Hubble. Each bright swirl in the photo is a **nebula**, a giant cloud of dust and gas.

New stars form inside nebulae. That happens when **gravity** pulls dust and gas together. These

spinning balls of material become larger over time. Eventually, they heat up and burst into new stars.

Over the decades, photos from Hubble like the one above have taught scientists a lot about how stars form and die, says Joseph DePasquale at the Space Telescope Science Institute. They've also increased the public's interest in the universe. "Hubble's images are awe-inspiring," DePasquale says.



A company that makes Halloween masks (above) adapted their design to make face masks (below) for pandemic safety.



ENGINEERING

STICKY MASKS

Earlier this year, as the coronavirus began to spread around the world, officials recommended people wear face masks in public. Leigh Radziwon and Kim Murray, the owners of Halloween mask company StickFX, jumped in to help! They designed protective masks with replaceable filters.

Parts of the masks are made from silicone. This material sticks to skin, creating a tight seal around the nose and mouth. The first **prototype**, or testable model, had straps that looped behind the ears. Later models included adjustable straps or no straps at all!

Connecticut-based StickFX has sold more than 8,000 masks since May. The company has also donated masks to essential workers. "We all have a duty to help during times of crisis," says Radziwon.

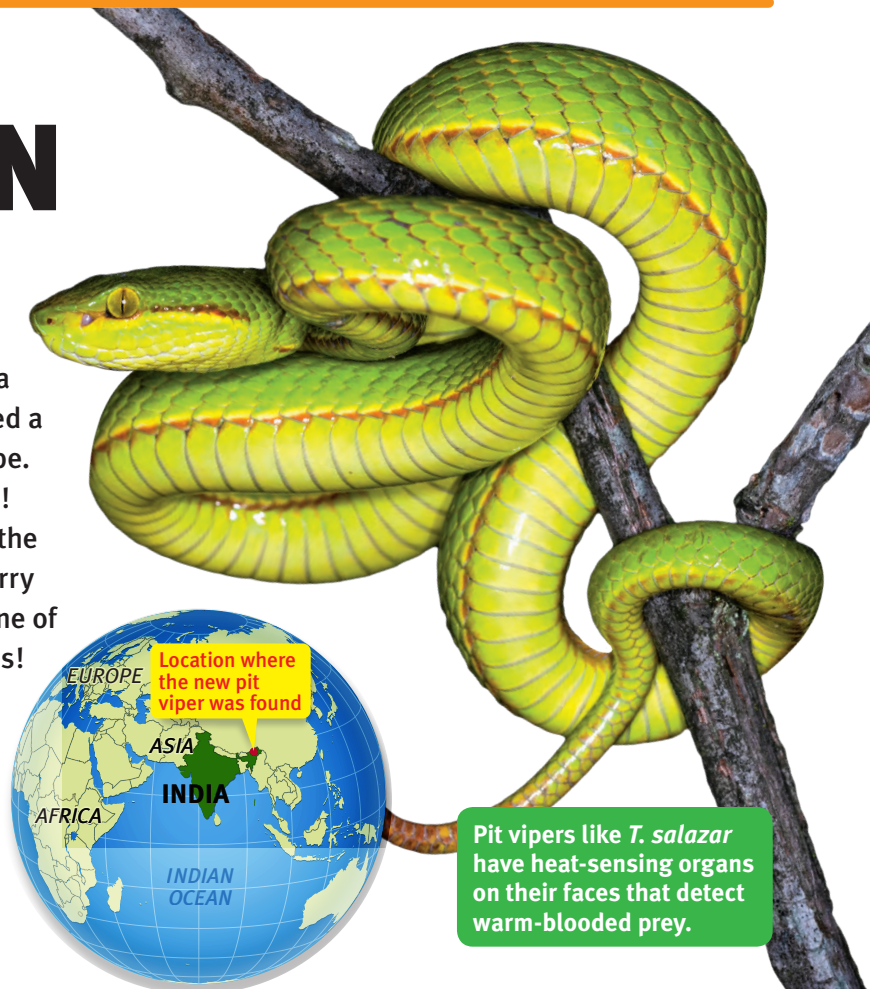
LIFE SCIENCE

SLYTHERIN SNAKE

In 2019, biologist Zeeshan Mirza was in a forest in northeastern India when he spotted a bright-green snake with a dark-orange stripe. It turned out to be an undiscovered species! Mirza named it *Trimeresurus salazar*, after the book character Salazar Slytherin. In the Harry Potter series by J.K. Rowling, Slytherin is one of Hogwarts' founders. He could talk to snakes!

The new snake is a type of pit viper. Pit vipers are **venomous**: Their bite injects a toxic substance that can be deadly.

Mirza hopes that naming the snake after Slytherin will help people feel connected to it. Many habitats where pit vipers live need to be protected, he says.



Pit vipers like *T. salazar* have heat-sensing organs on their faces that detect warm-blooded prey.

PAGE 2: NASA/JESA/STSCI (HUBBLE PICTURES); NASA VIA GETTY IMAGES (HUBBLE TELESCOPE); PAGE 3: AMOD M. ZAMBRE (VIPER); COURTESY OF STICKFX (HALLOWEEN MASK); COURTESY OF KIM MURRAY (FACE MASK); JIM MCMAHON (GLOBE)

The Fight Over Pompeii

Scientists feud over how to study an ancient city buried by a volcanic eruption

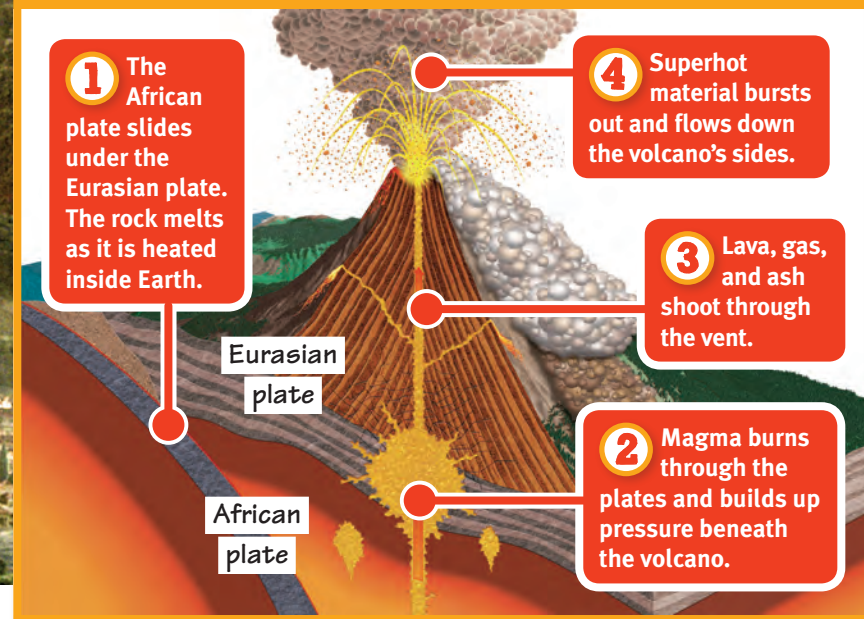
BONUS DIGITAL FEATURE!
Visit scholastic.com/superscience for a slideshow of the amazing artifacts found at Pompeii.



In 79 A.D., a volcano in southern Italy erupted. The explosion buried the nearby city of Pompeii.

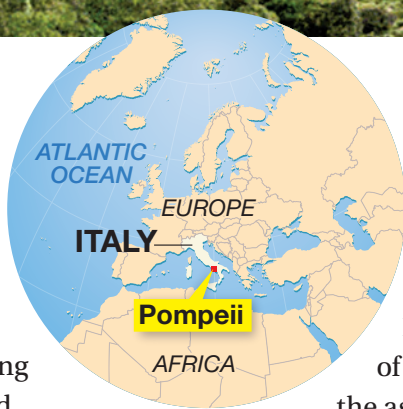
Inside a Volcano

Mount Vesuvius sits on two tectonic plates that are slowly shifting. Here's how that movement can lead to an eruption.



Think: What might affect how dangerous an eruption is?

» As you read, think about how studying past natural disasters can help people today.



The year was 79 A.D. in the bustling Roman city of Pompeii. For months, the city had been rattled by earthquakes. These ground-shaking events are common along Italy's west coast. So Pompeii's roughly

20,000 residents weren't very worried.

But the quivering earth was a warning. **Magma** was moving underground. And Mount Vesuvius, a towering volcano east of Pompeii, was about to blow. The eruption began with a massive gray cloud rising into the sky. Superhot

rock, lava, and gas raced down the volcano's slopes, burying Pompeii under 10 meters (33 feet) of ash. Over time, the ash hardened, preserving the city.

Since workers discovered Pompeii's ruins in 1748, researchers have been drawn to the site. But there's a problem.

Two groups of scientists want to study Pompeii: **archaeologists**, who study human history and culture, and **volcanologists**, who study volcanoes. To do their work, volcanologists need to analyze the layers of soil. But for many years, archaeologists have been digging up the city's remains, disturbing that soil. Can the experts find ways to work together?

JIM McMAHON (GLOBE); TRISTAR PICTURES/PHOTOFEST (POMPEII)
ILLUSTRATION BY ROBERT KEMP (VOLCANO DIAGRAM)

Mount Vesuvius



The ancient city of Pompeii spans 4.5 square miles. Vesuvius stands 6 miles east of the city.

have found graffiti promoting gladiator fights and even a fast-food shop. “We’ve found bones from fish and pigs that tell us what people ate,” says Ellis.

Evidence of the victims have also been unearthed. After the eruption, ash hardened around human bodies. As the bodies decayed, the cavities were left

behind, revealing the final moments of Pompeii’s people.

Sleeping Giant

For archaeologists, Pompeii’s treasures are buried in soil. But to volcanologists, that soil is worth more than gold. It contains material left by each eruption. These deposits provide clues about past eruptions, says volcanologist Christopher Kilburn.

In 2010, scientists analyzed the soil at Pompeii to build a model of the 79 A.D. eruption. The model revealed that ash, rock, and gas reached 300°C (572°F). It traveled at hurricane speeds, killing people instantly.

Chemicals in the deposits can also reveal what the magma inside the volcano was like just before the 79 A.D. eruption. If scientists find that the magma

NATIONAL GEOGRAPHIC IMAGE COLLECTION/ALAMY STOCK PHOTO (ANCIENT POMPEII); MARCO CANTILE/LIGHTROCKET VIA GETTY IMAGES (ARCHAEOLOGIST)

Researchers at Odds



Archaeologists dig into the ground to uncover buildings, artwork, and other artifacts.

Volcanologists study layers of soil to piece together the history of eruptions. But when the soil is disturbed, they can’t do their work.

is similar today, it might signal that the volcano is reawakening.

Vesuvius has erupted dozens of times, most recently in 1944, killing 26 people. If the volcano’s next burst is a big one, that could mean trouble for the 700,000 people living nearby.

Scientists in Conflict

Archaeologists have dug up about two-thirds of Pompeii so far. The Great Pompeii Project is working to restore the city and protect it from damage. But the group has also restricted many volcanologists from working there for the time being.

That’s why in 2019, a group of volcanologists, including Kilburn, published a letter in the scientific journal *Nature*. It criticized the Great Pompeii Project for making it difficult for volcanologists to access the site and for moving soil that could be used to study Vesuvius.

Kilburn hopes the matter is resolved soon. If the groups could cooperate, he says, “everyone would win.”

—Andrew Klein

words to know

magma—molten rock below Earth’s surface

tectonic plates—large slabs of Earth’s crust that move slowly over its inner layers

volcanologist—a scientist who studies volcanoes

archaeologist—a person who studies the past by examining human remains and objects

artifact—an object made by humans

ILLUSTRATION BY KATE FRANCIS

Uncover With Care

Hands-On Inquiry

OBSERVE Archaeologists must move soil to dig up artifacts. Volcanologists need to study undisturbed soil. Why might it be difficult for them to work in the same area?

MATERIALS glass bowl, wide-mouth jar, or clear plastic container • penny • sand or sugar • soil or coffee grounds • measuring cup • ruler • “excavation tools” like spoons, toothpicks, craft sticks, and index cards

PROCEDURE

STEP 1: Place a penny in the bowl. Cover it with a layer of sand about 3 cm (1 inch) thick. Smooth the sand’s surface so that it’s flat.

STEP 2: Carefully add a layer of soil about the same thickness. Smooth its surface.

STEP 3: Study the surface of the top layer. Examine the layers from the side of the

container. Record your observations.

STEP 4: Use your excavation tools to unearth the penny. How do the layers of sand and soil look now? Record your observations.

STEP 5: Brainstorm ways you could unearth a penny with less change to the layers. Repeat steps 1-4, testing one of your ideas.

RESULTS

How did each excavation affect the layers of soil?

CONCLUSIONS

1. Did your new excavation method better preserve the layers than your first one? How could you improve your method?

2. Based on your investigation, why is it hard for archaeologists and volcanologists to work in the same area?



Skeleton Scanner

Biologist Adam Summers reveals the insides of fish

As you read, think about what scientists can learn from looking at the insides of animals like fish.

Adam Summers is a marine biologist at the University of Washington. As part of his job, he investigates questions about sea creatures, like: How can some fish attach to rocks or burrow in the sand? What can armored fish teach us about protecting humans? To answer those questions, scientists need to understand the physical structures of fish. That's why for the past three decades, Summers has been creating



Adam Summers

What made you decide to start scanning fish?

I study **biomechanics**, the structure, function,

3-D images of fish skeletons. To make them, he uses a machine called a **CT scanner** (see *Inside a CT Scanner*, page 9). Summers posts the images online for researchers to study. Summers has also turned fish skeleton images into vivid works of art. For these pictures, he uses a different process that involves staining the fish's bones with colorful dyes and photographing them against a bright light. Summers recently spoke with *SuperScience* about his fish-scanning process.

and movement of living things. In 1992, a group donated a CT scanner to our lab. This machine uses invisible waves of energy called **X-rays** to take pictures of structures inside the body. A computer combines the images to create a 3-D picture. I scanned fish one at a time and enjoyed looking at the data. When I shared the pictures, people asked to scan their favorite fish. Eventually I decided to try to scan them all. So far, we have scanned over 4,000 species!

How does the scanning process work?

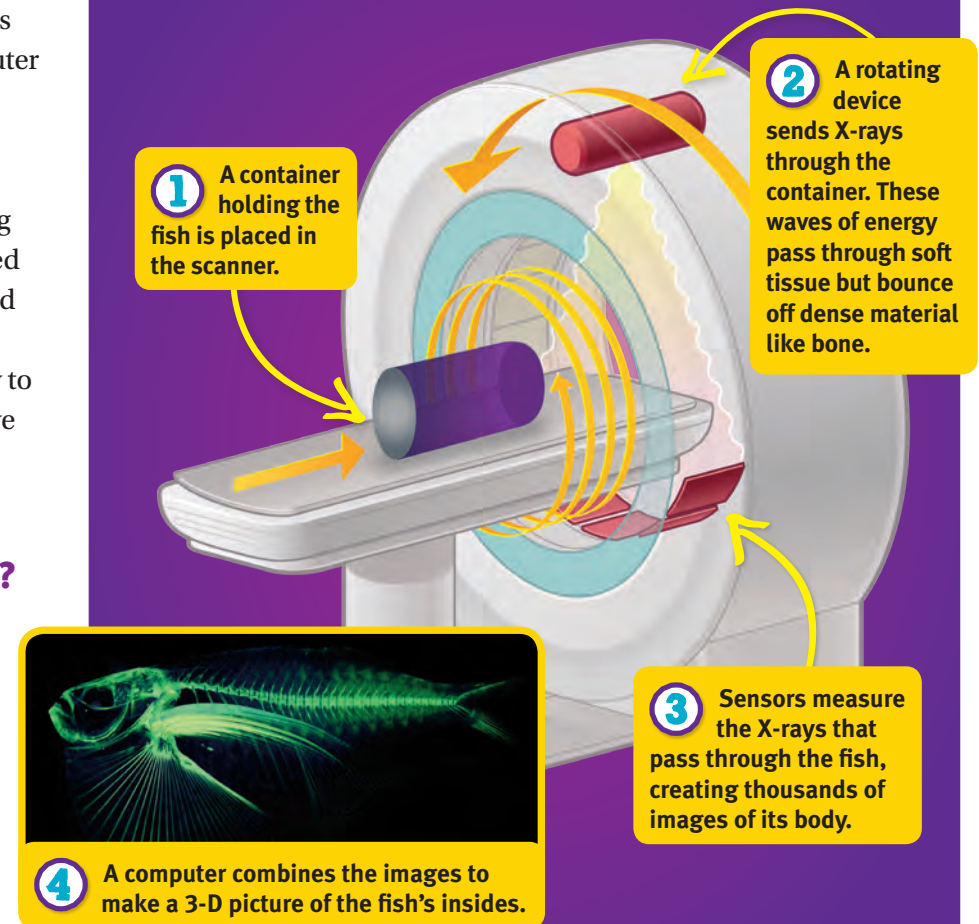
We borrow preserved fish specimens from museums. When they come to the lab, we take them out of the plastic bags they are shipped in. We wrap several fish up together in cloth soaked with a substance called ethanol. This keeps them from drying out in the machine. Then we pop the wrapped up mass into a plastic cylinder. The cylinder goes into the CT scanner, and all the fish are scanned at the same time.

What new things have the scans revealed?

People have used the data for hundreds of projects. We learn all sorts of things: the anatomy of new species, how bones fit together, which fish

Inside a CT Scanner

There are many types of CT scanners. Here's how one type of scanner can be used to create an image of a fish skeleton.



have really dense or large bones, and how scales and bones interact.

How can the images help scientists?

We have described new species of fish, and that has been really special. It is so neat to be involved in expanding our

understanding of **biodiversity**, Earth's variety of living things.

What do you love most about your job?

I get up every morning and get to ask questions that interest me. I love finding the edges of what we know and pushing those boundaries a little further out.

—Jeanette Ferrara

Thirsty for Blood

Meet five creatures that feast on blood

You've probably seen vampires in movies or video games. But bloodthirsty creatures exist in real life too! About 30,000 species of animals feast on blood, including insects, birds, mammals, and fish.

Blood isn't hard to find—it pumps through the bodies of all kinds of animals. "But there are many **adaptations** animals need to feed on blood," says Sebastian Kvist, a biologist at the Royal Ontario Museum. For instance, bloodsucking creatures have special body parts to pierce the skin of other animals and draw blood. Many also have chemicals in their saliva called blood thinners that keep blood from clotting as they feed.

Here are five animals that feed on blood—and how they get their liquid meals!

—Alessandra Potenza



The teeth of this fish, called a sea lamprey, are made of keratin—the same material your hair and nails are made of!



Sea lampreys have a rough, bony tongue to pierce the flesh of other fish.

Sea Lampreys

The monstrous mouth to the left belongs to a sea lamprey. This fish lives in the Great Lakes as well as the Atlantic Ocean along the coasts of Europe and North America.

Young lampreys eat algae. But after a few years, the fish become **parasites**. Adults have a round mouth lined with hundreds of teeth. They

use these teeth to grip the skin of trout, salmon, or perch for weeks at a time. They drill a hole in the fish using a bony tongue and drink its blood.

In the ocean, lampreys don't usually kill their **hosts**. But the smaller lake fish often die after a lamprey attack. In the Great Lakes, one lamprey can kill 18 kilograms (40 pounds) of fish a year!



Vampire Bats

Some people think that all bats drink blood. But only three species of bats out of 1,400 do. They're called vampire bats, and they live in Central and South America.

Like all bats, vampire bats can fly. But they have longer thumbs on their wings than other bats. That lets them quietly creep across the ground and onto the feet of cows, horses, and birds. The bats then use heat-sensing skin around their nose to detect warm blood. They make a cut with their teeth and lap up blood with their tongues.

As vampire bats feed, their kidneys quickly absorb water from the blood, causing the bats to pee. That makes them less bloated, so they can fly away fast!



A vampire bat feeds on blood from a bird's foot.

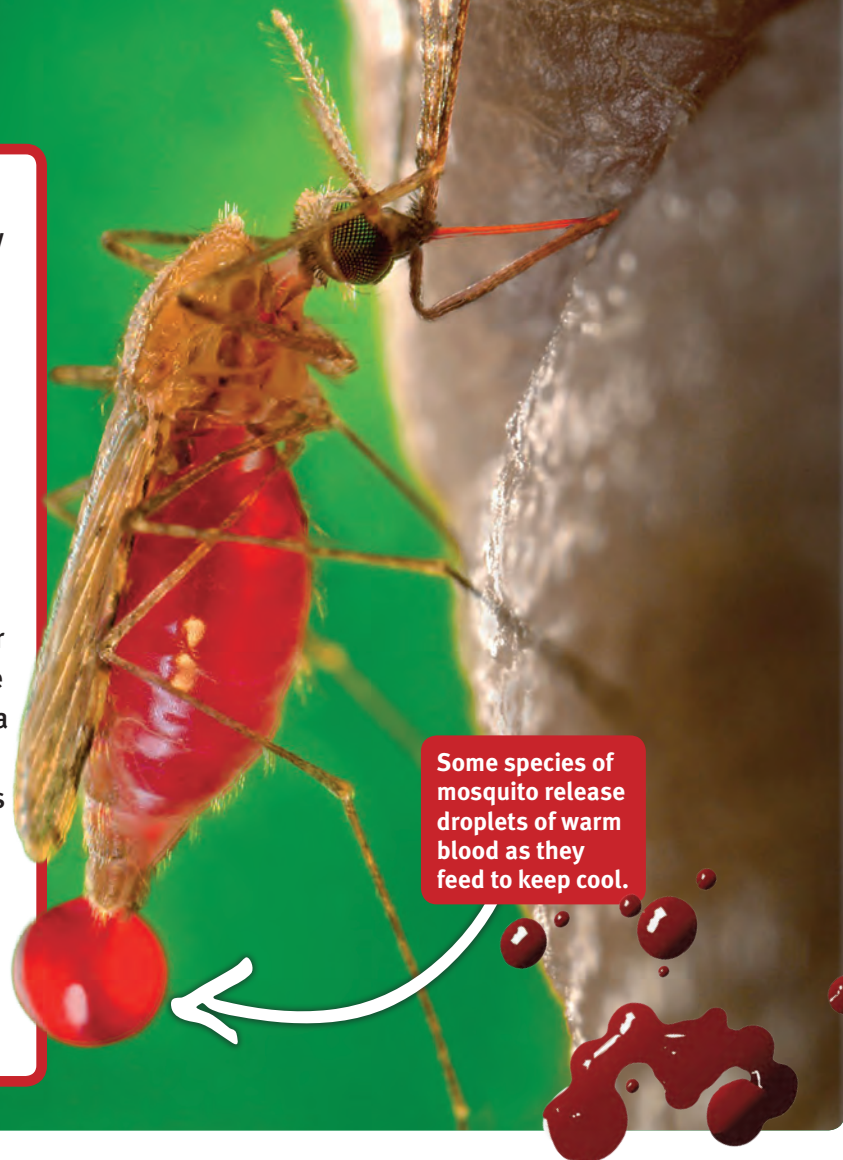
PAGE 10: USGS (LAMPREY); SHUTTERSTOCK.COM (BLOOD DROPS); PAGE 11: PAULO OLIVEIRA/ALAMY STOCK PHOTO (LAMPREY ON FISH); BARRY MANSSELL/NATUREPL.COM (BAT FLYING); DIETMAR NILL/NATUREPL.COM (BAT DRINKING BLOOD)

Mosquitoes

You're probably familiar with this bloodsucker. But did you know that only female mosquitoes drink blood? These blood meals allow the insects to produce eggs.

A mosquito finds humans and other animals by using its **antennae** to detect the carbon dioxide gas they breathe out. The mosquito then uses its mouth, which is made of six needles, to pierce their skin and suck blood for a few seconds. During its meal, the insect injects its victims with saliva containing blood thinners. Your body reacts by releasing chemicals that make the bite super itchy!

Mosquito saliva can carry **viruses** and parasites. Diseases spread by mosquitoes kill millions of people a year. That makes the bug the world's deadliest animal.



Some species of mosquito release droplets of warm blood as they feed to keep cool.

Leeches

Leeches are worms that live in ponds and oceans on every continent. These parasites drink the blood of animals like birds, fish, and even humans!

Most leeches have round mouths with three jaws and up to 300 sharp teeth. They attach their mouths to the skin of a host and move their jaws side to side to make a cut. Leeches usually suck blood for 45 minutes, but some stay on their hosts for weeks. Super-stretchy skin lets the worms draw up to 10 times their weight in blood.

These adaptations make leeches useful in medicine! Some leeches are used to treat diseases and increase blood flow after certain surgeries. The powerful blood thinners in their saliva have been used to make medications.



A practitioner squeezes blood out of a leech used for treatment in India.



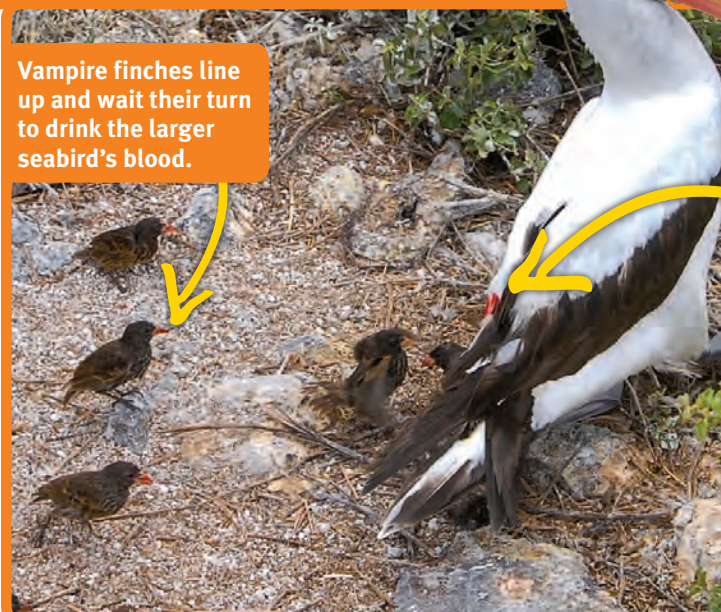
Vampire Finches

Vampire finches are fist-sized birds that live on two of the Galápagos islands in the Pacific Ocean. They normally eat seeds and insects. But when those run low, they feed on the blood of other birds!

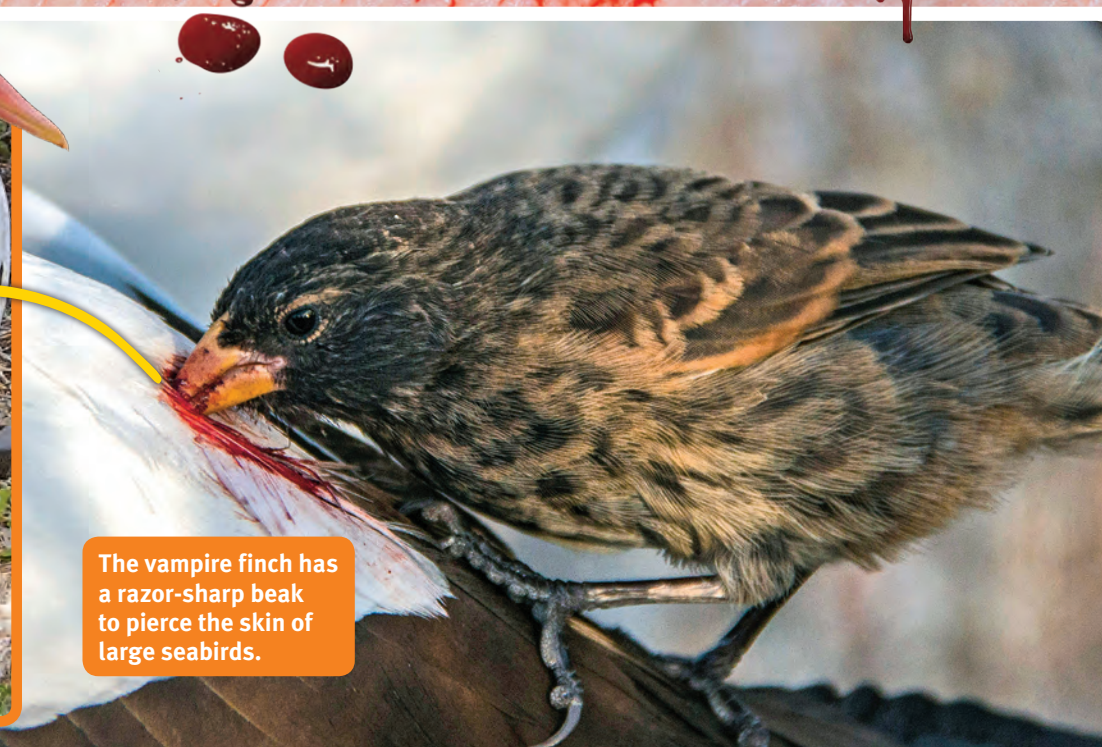
The finches work together to attack large seabirds. One finch hops on the seabird's back and pecks at its skin to make a wound. Other finches wait for their turn. They don't drink enough blood to harm their victims.

The blood diet gives vampire finches an edge over other finch species when food is scarce. As a result, vampire finches are the most numerous finches on the islands.

Vampire finches line up and wait their turn to drink the larger seabird's blood.



The vampire finch has a razor-sharp beak to pierce the skin of large seabirds.



words to know

adaptation—a body feature or behavior that helps an animal survive

parasite—an organism that lives on or inside another organism and often harms its host

host—the organism that a parasite lives on or inside

antennae—feelers on the head of an insect

virus—a tiny particle that causes disease



Last fall, students at an Illinois elementary school kept almost 2 tons of pumpkins from going to landfills.

Pumpkin Smash!

There are better ways to get rid of your jack-o'-lantern than tossing it in the trash

» As you read, think about what happens to your jack-o'-lantern after Halloween.

On November 2, 2019, dozens of people hauled giant pumpkins and grimacing jack-o'-lanterns to Elmwood Elementary School in Naperville, Illinois. Kids pitched the pumpkins into a trash bin and

then jumped in themselves! They smashed the pumpkins with their feet. "It was so much fun!" says 11-year-old Jack Bell.

Events similar to this one, called Pumpkin Smash, are



Jack-o'-lanterns usually begin rotting within 10 days of carving.

held after Halloween across the U.S. These smash fests aren't just for fun. They help the environment by keeping thousands of pumpkins out of landfills. There, the fruits would **decompose**, or break down, releasing harmful gases.

Instead, pumpkins collected at the events are recycled into soil. "It's about helping the planet," says Kay McKeen. She's the founder of SCARCE, a group that organizes Pumpkin Smash events in Illinois.

Shrunken Head

If you've ever left a jack-o'-lantern outside for a week or two, you might have noticed black blotches on its skin. These are produced by tiny organisms, like **bacteria**, that feed on the pumpkin. The grinning head shrinks and shrivels. That's because pumpkins are 90 percent water. As the fruit decomposes, the water slowly **evaporates**, or turns from liquid into gas.

After Halloween, many Americans toss their pumpkins in the trash. Each year, 650,000 tons of pumpkins end up in landfills. The gourds are buried under garbage. When food and plant-based waste decompose underground without any oxygen, bacteria release a gas called methane. The gas stays in Earth's atmosphere, trapping some of the sun's heat and contributing to **climate change**.

That's why groups like SCARCE collect pumpkins. After the events, the smashed fruits are brought to facilities where they're shredded and left in piles (see *Gourd to Ground*, right).

Workers regularly flip the piles so that bacteria have oxygen and don't release methane. This process is called **composting**. After about six months, the pumpkins turn into a material similar to dark soil that is rich

in nutrients. When it's added to gardens, it helps plants grow!

Pumpkin Pals

Another eco-friendly way to get rid of your pumpkin is to donate it to a zoo. Several zoos, like the Oakland Zoo in California, collect pumpkins for animals to eat or play with.

Elephants love to crush the fruits and eat them. The Oakland Zoo then composts the animals' pumpkin-filled poop!

So what will you do with your Halloween pumpkin? By keeping it out of landfills, you can help the planet. "We can all be champions of the environment," says McKeen.

—Alessandra Potenza



Gourd to Ground

Here's how pumpkins are composted.



1 Candles and decorations are removed from donated pumpkins. The gourds are shredded and mixed with twigs and food scraps.



2 The shredded material is piled into long mounds. Machines turn over the piles every few days so that bacteria have oxygen.



3 After about six months, the material turns into compost and is sold to farmers. Compost contains nutrients that help plants grow.

💡 **Think:** Which step is key to prevent methane from being produced?



- 1 Observe:** Look closely at the photo above. What do you notice about it? What details stand out to you?
- 2 Think:** What do you already know that might help explain an element of the photo?
- 3 Explain:** What do you think is going on in the photo, and why? How do your observations support your claim?
- 4 Discuss:** Compare explanations with your classmates. How are your ideas similar and different? What new ideas did you get?
- 5 Wonder:** What questions do you still have? Record them on a separate piece of paper. You can research them later!

WHAT'S REALLY GOING ON HERE?

Visit [scholastic.com/superscience](https://www.scholastic.com/superscience) to find out.

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