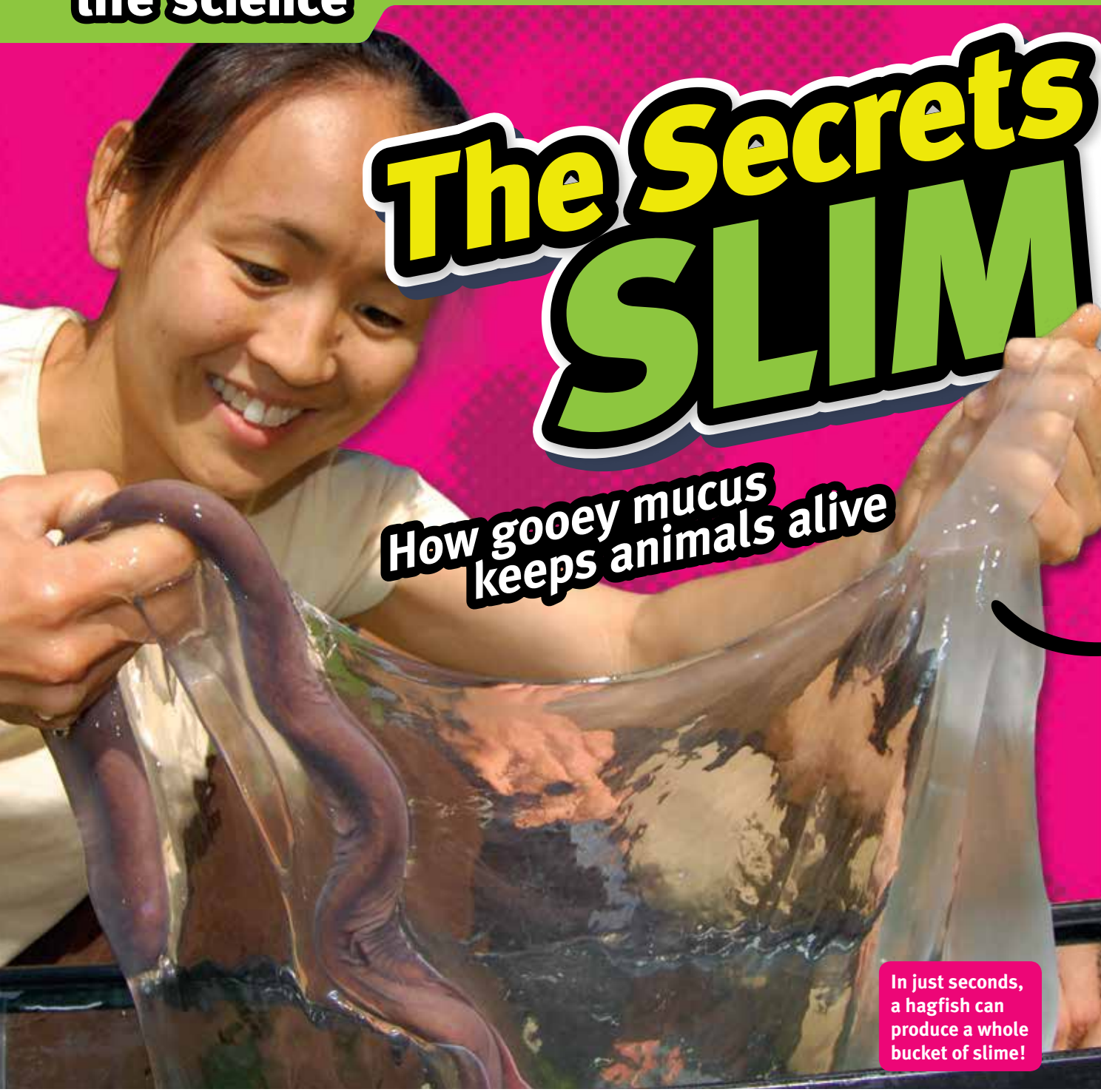
The Secrets of SLIM

How gooey mucus keeps animals alive



In just seconds, a hagfish can produce a whole bucket of slime!

A shark swims through the Pacific Ocean, searching for its next meal. It spots a hagfish, an eel-like animal, resting on the seafloor.

The shark moves in. It bites into the hagfish. But then something goes wrong. The shark's mouth suddenly fills with a thick, gooey substance. The hagfish has released its secret weapon: slime. The shark gags and swims away, leaving the hagfish alone.

In a fraction of a second, a hagfish can make about 1 liter (4 cups) of slime, making it one of the slimiest creatures on Earth. But it's far from the

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Hagfish live on the seafloor and use slime to defend against predators.

only one that uses this gooey substance to survive. Many animals—including humans—make slime, which scientists call **mucus**.

Animals use slime to move around, to defend themselves, and even to communicate. By studying slime, scientists hope to learn how its special properties can help people too.

Masters of Slime

Douglas Fudge is a biologist at the University of Guelph in Canada. He studies hagfish.

"Hagfish make ridiculous amounts of slime in a very short amount of time," says Fudge. This **adaptation** protects the animal from predators.

When a hagfish is attacked, it flexes its muscles. This squeezes mucus out of special **glands** in the animal's body. The glands also release tiny silk-like fibers that expand in the water. They mix with the mucus and seawater to form a sticky slime that predators can't swallow.

Hagfish have a trick to keep from getting stuck in their own slime. They twist their flexible bodies into a knot, then slide through the knot to wipe themselves clean.

On the Move

Hagfish use slime to defend themselves. So does an animal called the parrotfish, which cloaks itself in mucus to deter predators while it sleeps.

Other creatures, like slugs and snails, are covered in mucus all the time. The slimy coating keeps their bodies from drying out, says Christopher Viney. He's a materials scientist at the University of California, Merced.

Mucus also helps slugs and snails move around their environment. The slippery substance **lubricates** their undersides, allowing them to glide over rough surfaces like gravel or tree bark. Viney has even seen a slug climb across razor blades without getting hurt. "I think the slug enjoyed having its belly rubbed," he says.

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Mucus helps a snail glide over rough surfaces.

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words to know

mucus—a thick, slimy substance produced by an animal's body

adaptation—a change in the body or behavior of a species over many generations, making it better able to survive

gland—an organ in the body that releases a particular substance

lubricate—to reduce friction and allow smooth movement

Slime has unique properties, says Viney. It flows like a liquid to help a slug move. But it's also tough, like a solid material. If a slug climbs a window, its slime is strong and sticky enough to keep it from sliding down.

Slugs can even use slime to communicate. If a slug comes across another slug's slime trail, chemicals in the mucus tell it when the other slug was there and which way it went.

Slimy Future

Slime's properties are useful to many animals—including people (*see Your Slimy Self, below*). The same properties are also inspiring new technology.

For example, researchers at the Massachusetts Institute of Technology have developed a robotic snail. It uses a slime-like substance to crawl up walls and across ceilings, which most robots can't do.

Parrotfish sleep in a bubble of their own mucus to protect themselves from predators.

Fudge and his team study the tough fibers in hagfish slime. The silk-like structures could inspire new fibers for clothing, says Fudge. Fabric made from these fibers wouldn't be slimy. But it would break down easily once the clothes are thrown out, making the material environmentally friendly.

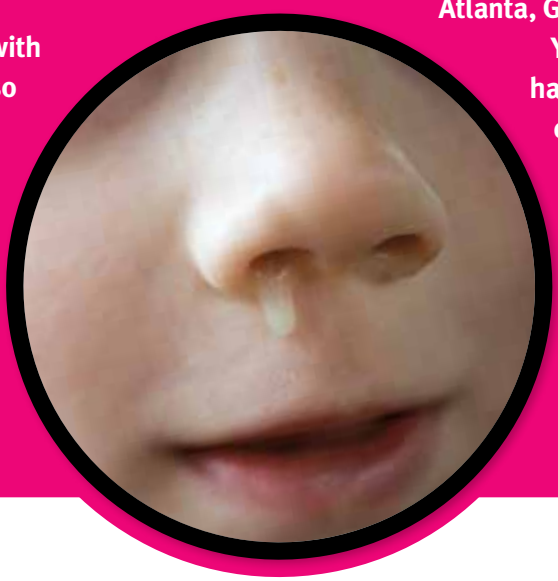
Scientists study mucus for one more reason: because it's fun, says Fudge. He's been working with slimy hagfish for 18 years. "I didn't think I would continue studying them," he says, "but the slime just kept getting more and more interesting."

—Mara Grunbaum

Your Slimy Self

Wild animals aren't the only ones that need slime to survive. Mucus also helps the human body function.

You're probably familiar with the mucus in your nose—also known as snot. When you have a cold, your body pumps out extra snot to fight invading germs. But this mucus helps you when you're healthy too. When you inhale, the sticky substance traps tiny particles from the air. "It prevents dust and debris from reaching your lungs," says Dr. Roy Benaroch, a pediatrician in Atlanta, Georgia.



Your mouth, ears, and eyes have a protective mucus coating too. A mucus lining in your stomach keeps the acid that breaks down food from leaking into the rest of your body.

As gross as it is, slime keeps you alive. "It's very, very important," says Benaroch.

DAVID DOUBILET/NATIONAL GEOGRAPHIC CREATIVE (PARROTFISH); SPIKE MAFFORD/AGE FOTOSTOCK (RUNNY NOSE)