

Comprehension

Genre

A **Nonfiction Article** in a newspaper or magazine presents facts and information.



Make Inferences and Analyze

Main Idea and Details

The main idea is the most important point an author makes. Details give more information about the main idea.

Gecko Glue, Cockroach Scouts, And Spider Silk Bridges

*How can lizards,
cockroaches,
and spiders help
make life better
for humans?*

How do product makers come up with big **innovations**? For some of their best new ideas, methods, and devices, scientists and researchers turn to designs found in nature for inspiration.

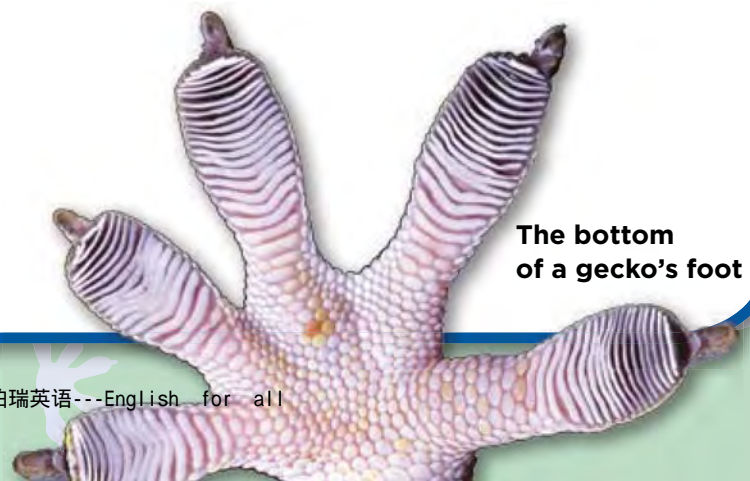
WHAT MAKES GECKOS STICK?

They run across ceilings. They zip up and down walls. What kind of crazy glue keeps geckos from tumbling down? Researchers at the University of California, Berkeley, and Lewis and Clark College in Portland, Oregon, have solved the mystery.

Scientists say that what makes geckos stick isn't tacky glue or

suction, it's geometry. "We've solved the puzzle of how geckos use millions of tiny foot hairs to adhere to even smooth surfaces, such as polished glass," says scientist Kellar Autumn.

Gecko feet are covered with millions of tiny hairs called setae (SEE-tee), which split into hundreds of even tinier branches. Each gecko foot has as many as one billion of these split ends. Researchers



The bottom
of a gecko's foot

found that the angle the toe hairs make with a surface allows them to stick. As scientists watched films of geckos in action, they noticed that geckos curl and uncurl their toes to get them to stick to surfaces.

Why the big interest in gecko “glue”? Researchers believe that a human-made version would be an ideal dry adhesive that could be useful underwater or in space. Researchers have already made artificial hair tips that stick almost as well as the geckos’ own. “Now we’ve got to make billions of them to get significant adhesive force,” says engineer Ron Fearing.

One thing is certain—it’ll be a super glue. A million tiny setae, **concentrated** in an area the size of a dime, would be strong enough to lift a 45-pound child!

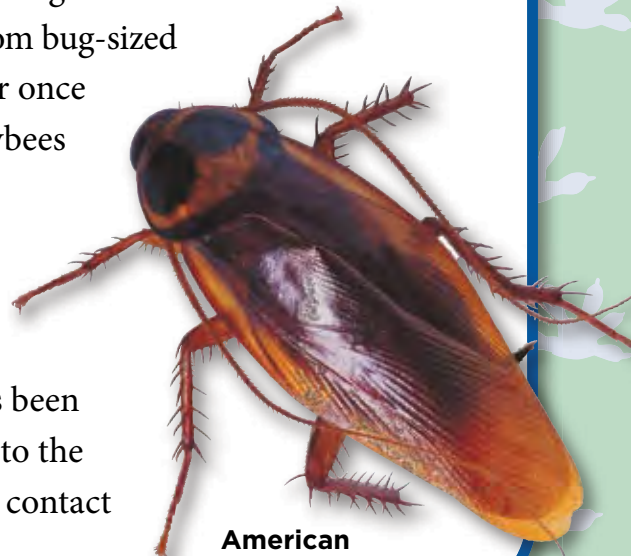
A gecko
clings
upside-
down to
glass.

COCKROACH SCOUTS

Think before you squish: The next roach you step on could save your life. That, at least, is the goal of Jeff Brinker, a scientist at Sandia National Laboratories in Albuquerque, New Mexico. Brinker and his team have thought of a way to use these insects to detect chemical or biological dangers.

The idea isn’t as strange as it may sound. The government is already exploring how to use everything from bug-sized robots to live wasps for similar tasks. Brinker once worked on a project that tried to train honeybees to sniff out explosives.

Roaches were a natural next step. “It’s a very durable beast,” Brinker says. “Plus they tend to explore nooks and crannies.” The key, Brinker says, is to use yeast that has been genetically **altered**. The yeast cells are glued to the bug’s body and will glow when they come in contact with something harmful.



American
cockroach

Living cells have several advantages over sensor machines, says Susan Brozik, a scientist working with Brinker. They're small, cheap, and very sensitive to their surroundings. Agent Roach reporting for duty!



The silk in a spider web is both flexible and strong.

THE ITSY-BITSY SPIDER IS A BIG BUILDER

Legend has it that when the mighty ruler Genghis Khan (JEN-gis KAHN) conquered Asia, his soldiers were protected from enemy arrows by very special clothing. These leather garments were interwoven with one of the strongest materials then known to humans—spider silk!

Eight hundred years later, scientists still can't make thread more durable than the stuff spiders use to make webs. But biologists trying to copy nature's strongest fiber are making great progress. The U.S. Army plans to use one of the Great Khan's tricks: making bulletproof vests woven with artificial spider silk.

What makes spider silk so remarkable is its unique combination of strength and stretch. Spider silk is as strong as the fiber now used to make bulletproof vests, but far more elastic. The

web of a golden silk spider is strong enough to trap a bird. Researchers have figured out that a web woven of spider silk the thickness of a pencil could stop a jet in midair!

“When you think about the size and speed of a flying bee, the web that catches it has to be able to **absorb** a lot of energy,” says Jean Herbert, an Army scientist in Natick, Massachusetts. Herbert is researching ways to use the tough fiber in everyday objects. Among the possibilities: jeans that don’t wear out, car and truck bumpers that resist dents, and bridges whose structures will not easily **erode** and can withstand earthquakes.

Unlike silkworms, spiders cannot be raised on farms. (One reason: they tend to eat one another!) So scientists are inventing ways of making spider silk without spiders.

The ability to spin a web is controlled by certain genes inside the cells of spiders. Researchers at two chemical companies have made copies of these genes and put them into certain easy-to-grow bacteria. The scientists’ goal: bacteria that can churn out spider silk. Transplanting spider genes is a sticky business. The genes don’t always act exactly the way they would in a living spider, so the silk is not as strong or elastic as the real stuff.

For now, the surest silk-production method is the one that Genghis Khan supposedly used—spiders themselves. “I never step on spiders,” says chemist John O’Brien. “I have too much respect for them.”



Spider silk is strong enough to trap flies and bigger prey.

Think and Compare



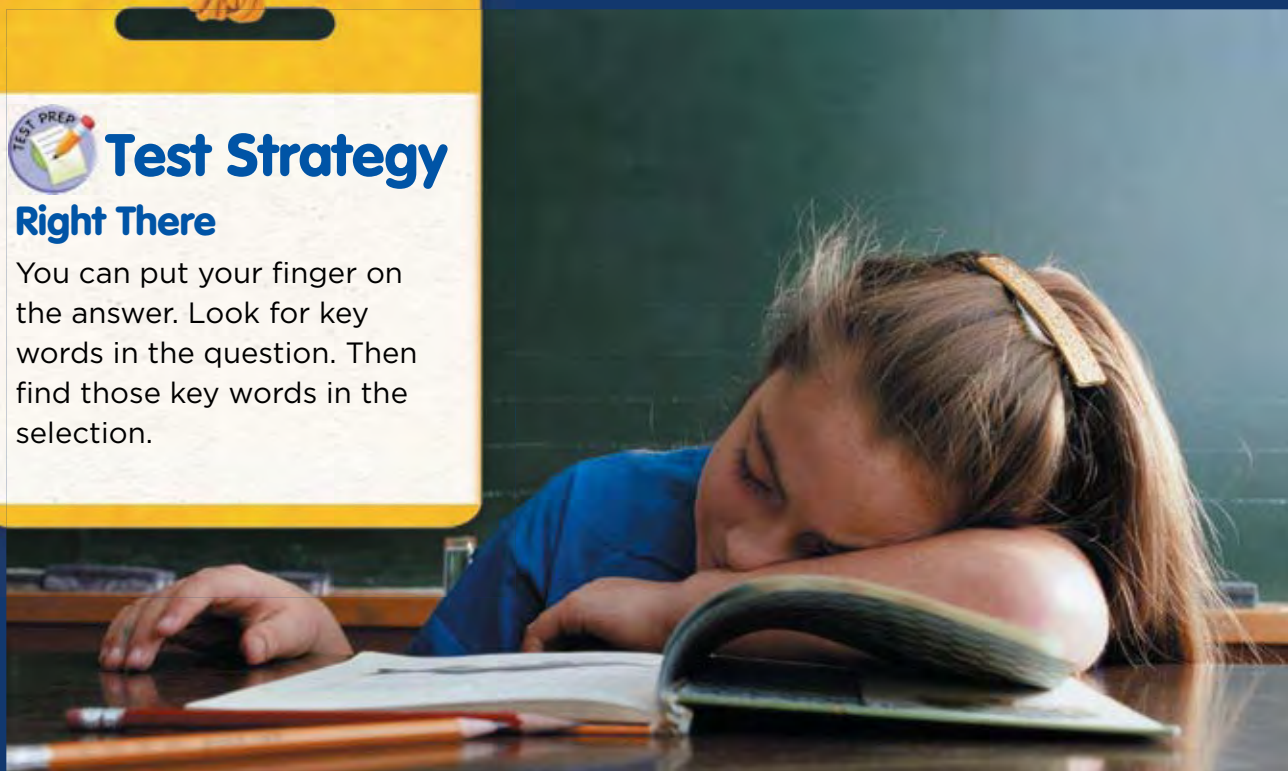
1. What covers the feet of geckos and allows them to stick to walls?
2. Why are scientists interested in duplicating spider silk?
3. Of these three projects, which one will help the world the most? Explain your ideas.
4. How are the scientific innovations described in “How Long Will We Live?” on page 68 different from those in the gecko glue article?



Test Strategy

Right There

You can put your finger on the answer. Look for key words in the question. Then find those key words in the selection.



SLEEP is GOOD FOR YOUR BRAIN

Tired of puzzling over a problem? Sleep on it! Research by a group of German scientists shows that getting enough sleep makes people better problem solvers. They found that people who sleep for at least eight hours each night are better at solving problems and thinking creatively. For their research study, the scientists divided 106 people into groups. The group that got eight hours of sleep was more than twice as likely to find a shortcut for solving a math problem than the group that had stayed awake all night.

Skimping on sleep has become a bad habit for many American kids. According to a survey by the National Sleep Foundation, 51% of kids ages 10 to 18 go to bed at 10 P.M. or later on school nights. The foundation reported that nearly 60% of 7- to 12-year-olds admitted that they felt tired during the day.

This is important information for parents and for kids. Getting enough sleep can improve a kid's performance at school.

Directions: Answer the questions.

1. The research by a group of German scientists shows that

- A people who sleep enough are better problem solvers.
- B school administrators and parents should sleep more hours each night.
- C good math students do not require eight hours of sleep.
- D the National Sleep Foundation has 106 members.

2. According to the selection, how did the study group that got eight hours of sleep demonstrate that sleep improves performance?

- A They demonstrated more factual knowledge.
- B They found a quicker way to solve a math problem.
- C They scored much higher on standardized tests.
- D They did not doze off while taking the test.

3. Why is skimping on sleep bad for you?

- A American kids require more sleep.
- B Kids fail in school if they are not in bed by 8:00 P.M.
- C When you feel tired, you can't perform well at school.
- D Not getting enough sleep is good for your brain.

4. What is the main idea of this article?

5. Why do you think so many kids skimp on sleep?

Tip

**Look for
key words.**

Write to a Prompt

“Sleep Is Good for Your Brain” reports on the benefits of getting a good night’s sleep. Do you think people are getting enough sleep? What might be the benefits of getting more sleep? Use details from the article to support your answer.



I used details from the article in my answer.

In Praise of Sleep

Scientific research says that sleep is good for us. People who get enough sleep think better and do better work. Research also shows that most of us don’t get enough sleep and that a lot of kids feel tired during the day at school.

Getting enough sleep is like eating healthful foods or getting enough exercise. It is an important part of our daily life and something we all need to do.

It isn’t always easy to go to bed early enough to get 8 hours of sleep. We have to make adjustments in our daily routines. One thing we can do is find ways to get our homework done earlier. It will only take a few nights to prove that it is worth it. Not only will kids do better in school, but they will also feel better.

A good night’s sleep is an important part of our daily lives.

Writing Prompt

Getting enough sleep is important, as the selection “Sleep Is Good for Your Brain” points out. The article describes the short-term effects of lack of sleep. But what might the long-term effects be? How important is sleep? Explain what the long-term consequences of not getting enough sleep could be for young people. Use research to support your answer.

Writer's Checklist

- Ask yourself, who is my audience?
- Think about your purpose for writing.
- Choose the correct form for your writing.
- Plan your writing before beginning.
- Be sure your ideas are clear and organized.
- Use your best spelling, grammar, and punctuation.