

Renders

Literature Anthology



Genre • Expository Text

Big Ideas from Nature

by Adrienne Mason

Essential Question

Go Digital!

What ideas can we get from nature? Read how ideas from nature inspired new inventions. Inspiration

Sometimes a sticky situation can lead to a great invention. In the 1940s, George de Mestral went for a walk with his dog. Along the way, George's pants and his dog's fur caught tiny seeds called burrs. George was curious. Why did the burrs stick so well? He looked closer. The burrs were covered in tiny hooks. George used this idea to invent a two-sided fastener. It had hooks on one side and loops on the other. Today these hook and loop fasteners are used on everything from shoes to spacesuits!



Observing how burrs stick to cloth and fur inspired one inventor to create a new fastener.

Those sticky burrs gave de Mestral a great idea. Nature provided a **model** that George could imitate. Copying, or imitating, designs from nature is called biomimicry [bigh-o-MIM-i-kree]. (*Bio* means life and *mimicry* means to copy.) From owls' sharp claws to elephants' bendy noses, nature is full of models. We can learn from each one. Observing nature gives us ideas for new things. George de Mestral didn't set out on his walk thinking he would create a new fastener. But by being curious and observant, he did just that.

Nature Did It First

Designers often start with a problem. They may look for solutions in the natural world. Nature has been making and testing designs for a long time! Nature often has the answers to questions people ask.

More than a hundred years ago, the Wright brothers, Orville and Wilbur, wondered how to fly. For an answer, they watched birds, the flying experts. Watching bird wings gave them ideas on how to design airplane wings. While bird wings are not **identical** to plane wings, they both can fly. The Wright Brothers built an

airplane in 1903. It was the first to lift up, up, and away! Leonardo da Vinci was an artist and inventor. He lived more than 400 years ago. He looked at birds' wings and then drew plans for many flying machines.





Smart Shapes

Fish and cars share a problem. It takes energy to move a fish through water and a car through air. Fish get energy from food. Cars get it from fuel.

To create a new fuel-saving car, designers studied the shape of fish. They found that the boxfish's square shape was streamlined. This means that the fish slips through the water without wasting energy. By making the new car's shape **similar** to that of the boxfish, they created a car that saves gas.

The car's frame is also similar to the fish's skeleton. The metal frame is thick in some places and thinner in others, just like the fish's bones. This saves on materials and puts strength where it is needed most. Watching fish gave car designers a new idea for a car's shape.

Energy Savers

Air conditioners keep buildings cool. The shape of a building can also help. In Africa, termites gave builders an example of a self-cooling structure. Holes at the bottom of termite mounds catch the wind. The air rises through tunnels and flows out the top. The termites designed an effective way to cool a structure. The builders borrowed their ideas. During the day, fans on the first floor blow cool air into the building. The air rises and flows through chimneys on the roof. This design saves money and energy.

How is a termite mound like this building in Africa? They both need a way to stay cool.





Master Movers

You can't travel to Mars, but a robot can. Robots can explore places that are not safe for people. Robots can't walk, but they still have to travel over dips and bumps. Sometimes they get stuck. Designers are working on a robot called Jollbot to fix the problem. The name Jollbot comes from the words *jump* and *roll*. The Jollbot can do both. The super spring of grasshopper legs gave designers their idea. Grasshoppers and the robot, Jollbot, can both jump.

Tunnel Makers

More than 200 years ago, an engineer was trying to drill a tunnel under a river. But each attempt failed. The walls kept falling in. Then he saw how shipworms bored through wood. The animal uses a tough shield to drill. Then it builds a hard tube along the tunnel walls. What a great idea! The engineer copied the shipworm to build the Thames Tunnel. As he drilled, workers lined the tunnel walls with bricks.

Shipworms and tunnelbuilders need a way to drill through wood or rock safely.



Inspiration

Idea

shipworm's tunnel

264





Mixing New Materials

Tiny hairs on a gecko's foot help it climb walls. It can cling to ceilings, too. Scientists studied gecko feet to create a bandage with bumps. The bandage is so sticky it can even attach wet surfaces (like a human heart!). Sticky gecko feet gave doctors an idea for a super sticky bandage.

STOP AND CHECK

Summarize What did you learn from reading the section called "Mixing New Materials?" Tell what the section is about. bkgd) Volker Steger/Photo Researchers, Inc. (inset) Robert Langer and Jeff Karp



Working Together

Birds fly in flocks. Fish swim in schools. They do this without hitting one another. Cars move in large groups, too. But they often crash. Today, car designers are learning from locusts. They study how the insects travel together safely. One day you might drive a car that "sees" the cars around it. Ideas from locusts are helping to design safer cars.

STOP AND CHECK

Ask and Answer Questions Why are car designers studying locusts? Reread page 266 to find the answer.

Learning from the Experts

Biomimicry shows that ideas that work for nature can work for people, too. It makes sense. Need a material that is strong and stretchy? Learning about spider silk would be a good place to begin. Spider silk is one of the strongest fibers in nature. It is as flexible as an elastic band and strong like steel. Need a type of glue that will harden in salt water? What do the sea creatures barnacles and mussels use to stick to rocks? Maybe nature already has a plan or a recipe people can use!

Observing how nature works also shows us ways to help the planet. Nature does not waste materials or energy. And natural designs do not pollute the

Inspiration

Idea

air or water. Learning new things while protecting Earth's resources-that's an idea worth copying!

This cloth was woven from the silk that spiders use to spin webs.

About the Author



Adrienne Mason studied to be a scientist. Later on she decided that a life in a lab was not for her. Because she loved talking and writing about science, she began to write books instead. She has written more than twenty books for children. Most are about science, nature, and history. When she isn't writing, Adrienne likes to spend time outdoors. She hikes, camps, bikes, and walks on the beach near her home in western Canada.

Author's Purpose

Why do you think the author included pairs of photographs? What do the two photographs show?

Respond to the Text

Summarize

What ideas from nature led inventors to create new products? Information from your Main Idea and Details chart may help you summarize.

Main Idea
Detail
Detail
Detail

Write

How does the author organize the text to help you understand that each new idea starts with a problem? Use these sentence frames to cite your text evidence.

The author describes problems to . . . Then she compares to help me . . . This helps me understand how . . .

Make Connections



Describe how something in nature led someone to a new idea. ESSENTIAL QUESTION

Think about one of the inventions in this article. How has it made our world better? **TEXT TO WORLD**

Genre • Myth

Compare Texts

Read about how fish bones inspired a young inventor long ago in Athens.

PERDIX Invents the SAW

In the days of gods and goddesses, there lived an inventor named Daedalus (DED-uh-lis). He was famous throughout Greece for his good ideas and his bad temper.

One day Daedalus heard a knock on his workshop door. "Who's interrupting my work?" he growled.

"It's me, Uncle," said his twelve-year-old nephew Perdix (PER-dix). "I want to be a great inventor, too. Will you teach me?"

Daedalus's back hurt from chopping firewood. His shoulder ached from sweeping. He didn't really want to teach Perdix. Then he got an idea. "If you do all the chores, I'll let you watch me invent things," he said.

Perdix did the chores, cooked meals, and **observed** how Daedalus worked. The boy had some clever ideas. He wanted to make a smaller ax for cutting branches for firewood. Daedalus disagreed. "Just leave the inventing to me," he always hissed. One afternoon Perdix roasted a large fish for lunch. After eating, Daedalus licked his fingers and smacked his lips. "That was pretty good, Perdix, but I've eaten better," he said.

Perdix sighed and started washing the dishes. In the process he cut his finger on the jagged backbone of the fish. He held the backbone up and studied its

sharp edges. "I can **imitate** this design and make a fine tool for cutting wood," he thought.

The next day, Perdix sawed all the firewood before Daedalus awoke. "How did you finish your work so early?" Daedalus snarled.

"It was easy with my new invention," said Perdix. He showed his uncle the saw.

Daedalus was reluctant to praise his clever nephew.

"It should be *my* invention because you cooked that fish for me," he sniffed.

Perdix just smiled. He now realized that he was a great inventor, too.



Make Connections

How did nature inspire Perdix? ESSENTIAL QUESTION

What other inventions have you read about that were inspired by nature? **TEXT TO TEXT**