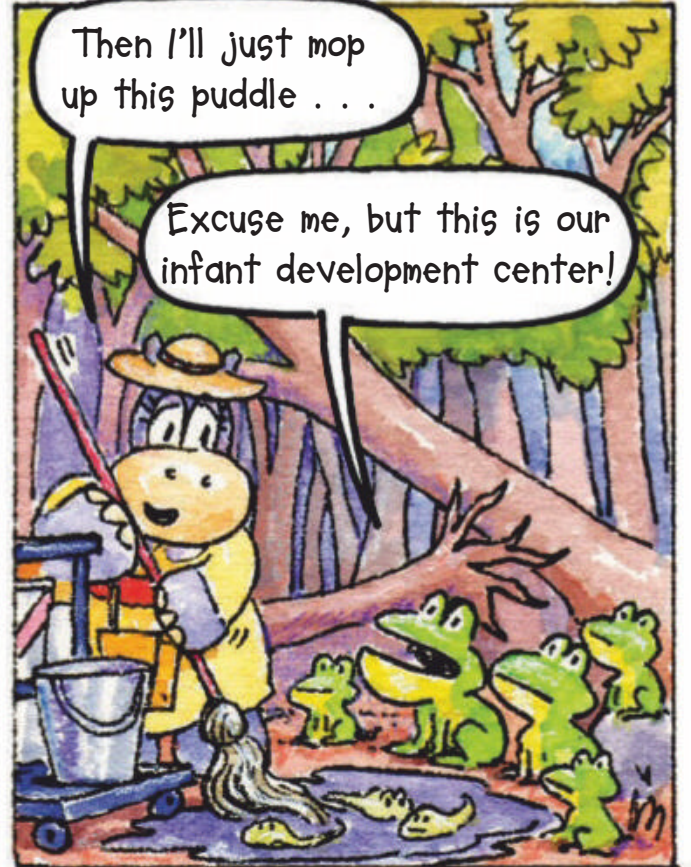
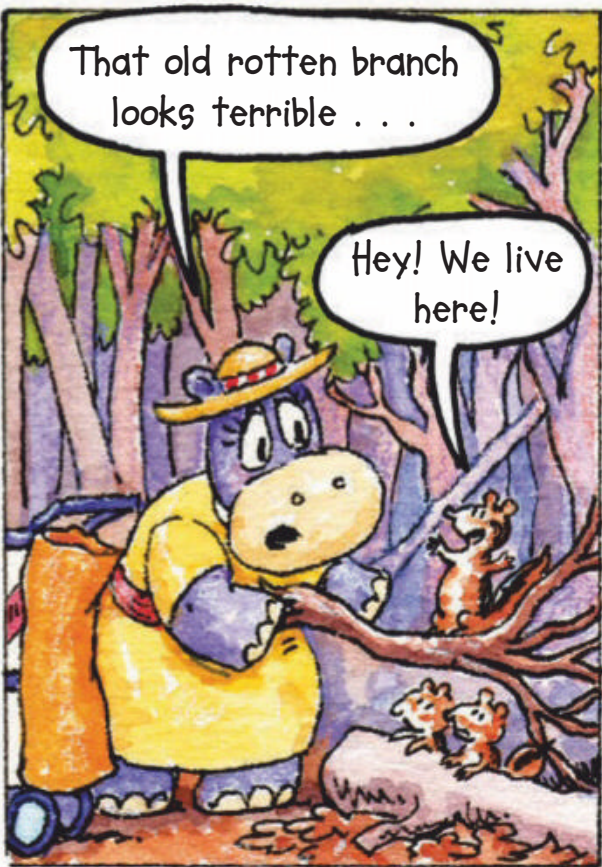




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MARVIN and FRIENDS



arts & sciences for kids

ask



A Walk in the Woods



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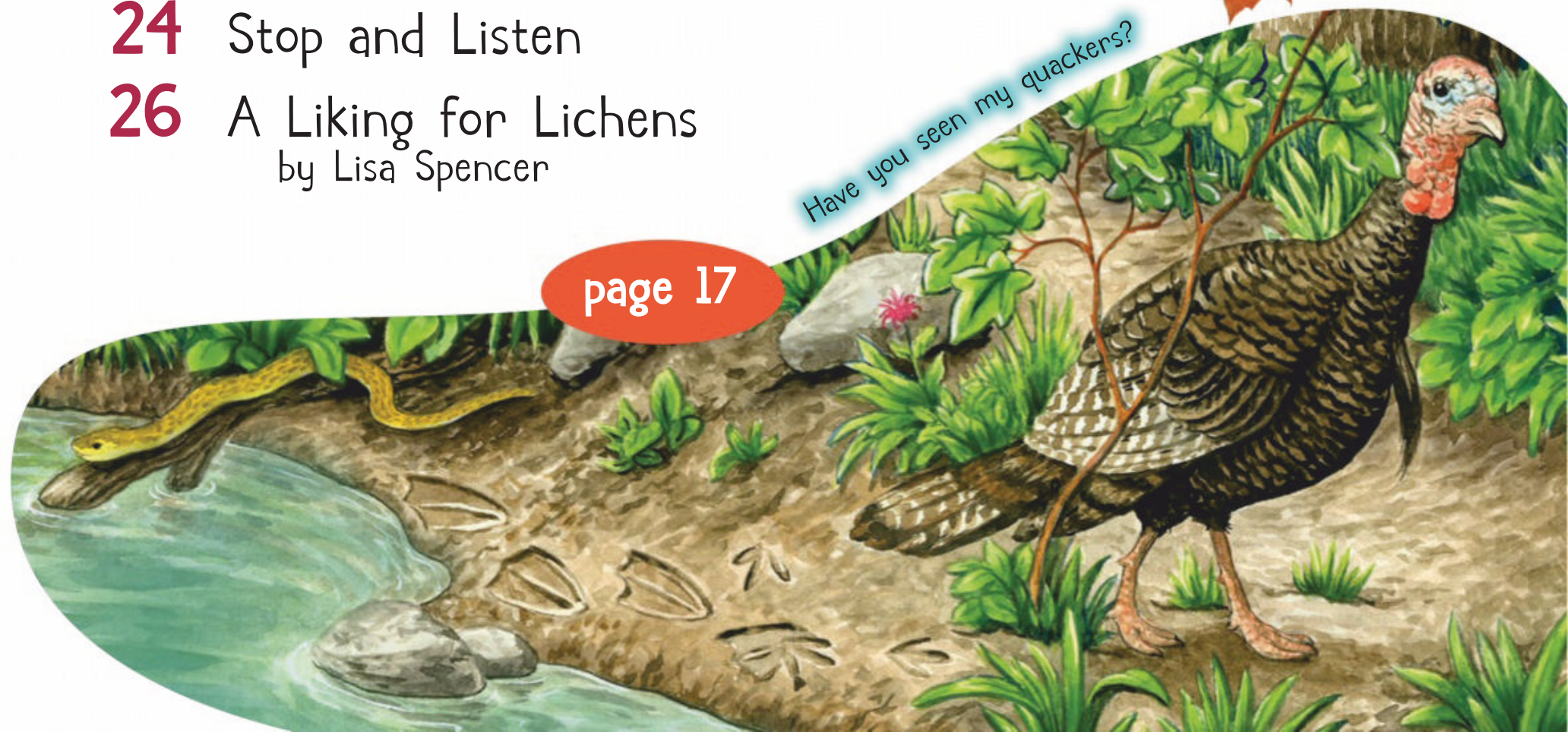
Who painted the leaves?



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Have you seen my quackers?

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by
Elizabeth
Preston

Bottles for Very Old Babies

Thousands of years ago, some people in Europe made strange clay cups with little spouts. Some of the cups were shaped like animals. Archaeologists who dug up these ancient cups didn't know what they were. But new research hints that they were baby bottles.

Scientists studied several spouted cups between 2,500 and 3,200 years old. They did chemical tests on the clay to see what the cups might have held. In two cups, they found traces of fat that matched the milk of cows, sheep, or goats. Another cup had traces of milk from pigs or humans. That means long ago, people may have used these cups to feed babies milk. And that would have meant healthier babies—anyone could feed them, when Mom was off hunting.

Babies! Have you
tried the latest?
Curly straws!



These
ancient pots
may be the
earliest baby
bottles.



OK, I think that's
enough moons!

More green cheese
for me!



THE THREE LITTLE (TOOL-USING) PIGS

For the first time, researchers have spotted pigs using tools to get stuff done. The animals are a species called the Visayan warty pig. Scientists saw three of these pigs using sticks or pieces of bark like shovels. The pigs held the bark or sticks in their

mouths and used them to dig nests in the dirt.

The pig-watchers left some spatulas around the animals' pen, to see if the pigs would use a different kind of tool to dig. But the swine preferred their all-natural shovels.



art © 2020 by Art Roché

SO MANY MOONS

Until last year, Jupiter held the record for most moons in our solar system, with 79. But now we have a new moon champion: Saturn.

Using a telescope in Hawaii, a team of scientists has discovered 20 new moons around Saturn, bringing the total to 82. The new moons are tiny. Most are under 3 miles (5 km) wide. They belong to a group that orbits far from the planet. They are likely the remains of a

larger moon that broke up. Seventeen of the new moons orbit the planet backwards, in the opposite direction to Saturn's spin. There may be even more smaller moons that scientists haven't been able to spot yet—though some are asking if small orbiting rocks should be called moons at all.

Don't feel too bad for Jupiter, though. It still holds the title of largest planet in our solar system.



Ready or not,
here I come!



This forest is so big
and empty! I'm sure I
can find a great place
to hide.

This looks
like a perfect
spot.



AHHH!

Get out of
our home!



Ouch!

Gotcha, Phil!



You weren't even hiding, Phil.

But...

Let's go
again.

Ok.



I could try
up there.



Hey, find your
own tree.



Gotcha
again.

FWUMP!



What's with this kid?



We need to find somewhere else to hide.



Phil, you're supposed to HIDE in hide-and-seek.

Hey guys! I found a great new hiding spot.

Let's try one more time.



8..9..10. Ready or not!



Found ya.



Gotcha.



Hey, where is Phil?



Over here! I finally found a spot with no animals.

I wonder where they all went?

It is kind of quiet all of a sudden.



Perfect! Let's stay all winter!

Little Questions in the Big Woods

art by Mary Sanche

Ah, spring. The perfect time for a walk in the woods. But wait, what's that? And how did that get there? The woods are full of mysteries.

How do trees know when it's spring?

A It gets warmer.

B The squirrels tell them.

C The days get longer.

Trees can sense temperature and light. Changes in the weather trigger changes in the trees. Trees slow down for winter when nights get longer. They wake up again when daylight lasts longer than night. They are not fooled by shade or street lights; sunlight is a different "flavor" of light to them. Trees also know it's time to grow new leaves when they feel several weeks of warm weather after a long cold spell.  A and C



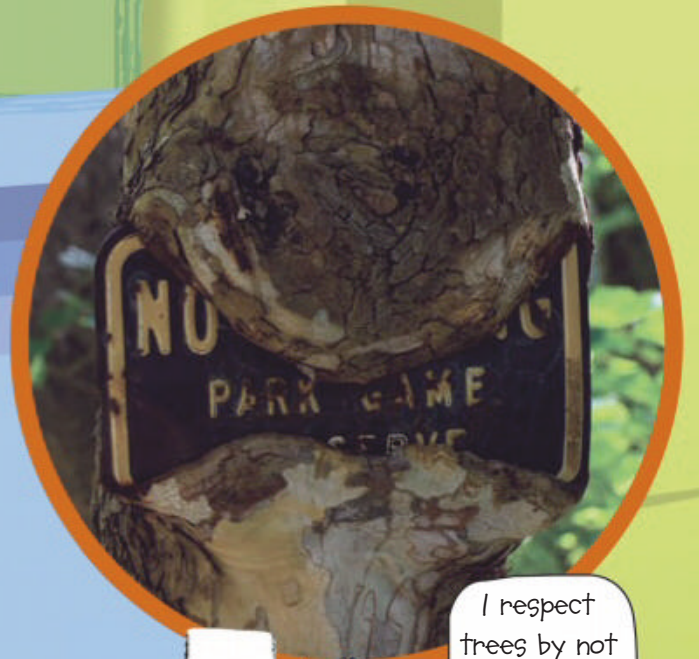
Why is that tree eating a sign?

A To get extra iron.

B The sign got in the way.

C It's controlled by a sign-eating fungus.

Trees never stop growing. They grow taller from the top and wider by adding new layers of wood just under the bark. If some rude person nails something (like a sign) to the tree, the tree grows its new layers right around it.  B



Why do leaves change color?

- A They get bored.
- B They turn off the green in winter.
- C Elves paint them.

In the winter, some trees drop their leaves (since winter is dark and the leaves just freeze). As the leaves shut down, their green sugar-making cells (chlorophyll) fade. The red and yellow pigments are not new—they've been there all along, hidden by the green. Evergreen trees keep their small leaves (or needles) all year round. That way they can get a jump start on making sugar in spring.  B



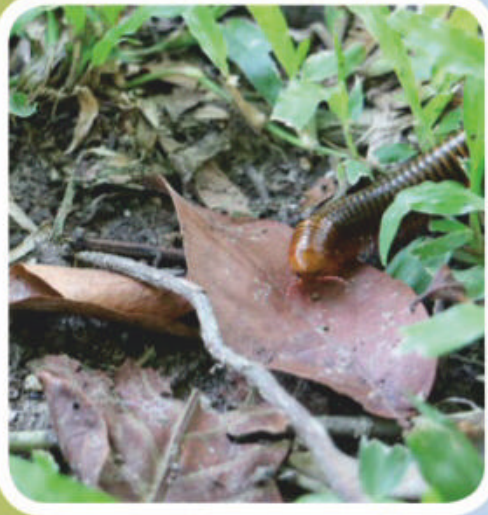
This year, let's try fuchsia.



Where do all the old leaves go?

- A They get eaten.
- B They turn back into soil.
- C They are recycled into new leaves.

If every tree in the forest drops a large pile of leaves every year...why isn't the world buried in old leaves? Thank the decomposers! Worms, insects, snails, bacteria, small animals, and fungi nibble up dead leaves. Yum! These creatures poop out digested leaf stuff, broken down into its basic ingredients again. Those nutrients go back into the soil. Trees suck up the recycled good stuff and use it to make new leaves. The forest is great at recycling!  All of the above.

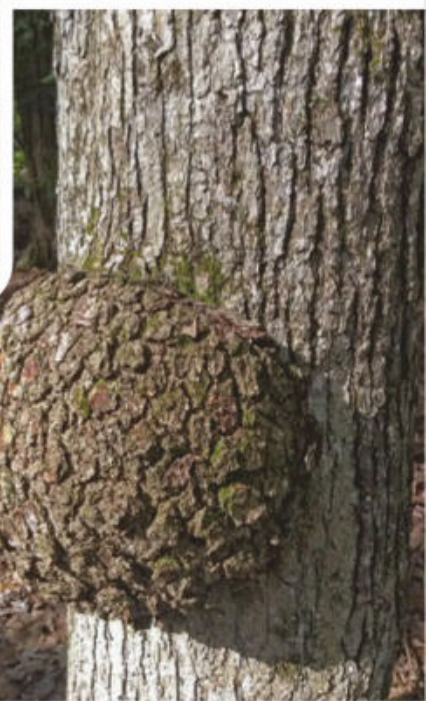


What's that lump on the tree?

- A It's growing around an irritation.
- B The tree is storing fat for the winter.
- C It has a tree disease that makes lumps.

Lumps on trees (called galls) are often caused by insects burrowing into the branches. The tree tries to fence off the bugs by growing bark around them, forming a lump. Galls can also be caused by bacteria or fungi. Sometimes an infection can cause a tree to grow strangely, forming lumpy growths called burls. Tree infections can also cause cankers, rough patches that look like a tree rash.

 A or C



Is that where baby trees come from?



Why does that leaf have bumps all over it?

A It has chicken pox.

B It's a fungus.

C Insect eggs.

Small lumps on a leaf are most likely insect eggs. Many insects lay their eggs on leaves. Sometimes the leaf grows a little lump, called a gall, around the egg. Many leaf galls contain the larvae of mites or tiny wasps.

C



It's going to be OAK-kay.

DR. MARVIN

Very handy!



How did those trees get stuck together?

A They are twins.

B A branch took a wrong turn.

C They are sharing sap.

Sometimes, if a tree grows a branch that rubs against its neighbor, the second tree will grow new bark right over it (very slowly, over many years). If the end of the branch then breaks off, it makes a little bridge between the trees.

B



Why does that tree have a hole in it?

A It's a doorway to another dimension.

B A deer ran through it.

C The hole is where an old log used to be.

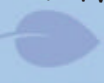
When a big tree falls, the trunk can serve as a nursery for new young trees. Seeds fall on the trunk, take root, and grow. The young tree's roots grow around the old trunk and stretch down to reach the ground. After many years, the old tree rots away, leaving a trunk-shaped hole where it used to be.

C



Why are leaves green?

- A All trees are Irish.
- B To look good to other trees.
- C Trees don't like green light.

Plant leaves are filled with tiny green power disks called chlorophyll. Their job is to catch energy from sunlight and use it to make sugar from air, water, and minerals. Sunlight is a mix of many different colors of light—lots of nice energy. But green light is hard for chlorophyll to use. So leaves bounce it back. We see the bounced light, and...green leaves.  C



Breathe,
and hold!



Why are all those trees bent?

- A Tree yoga.
- B People.
- C A tree disease.

This crooked forest in Poland has perplexed visitors for many years. Was it a freak storm? Do the trees have a wilting disease? One possible explanation is that they were bent by people in the 1930s, to make curved wood for ships or furniture. Then whoever bent the trees forgot about them, or decided they didn't need bendy wood after all. But not everyone agrees. So it's still a bit of a mystery.  B?



Why is that tree growing in a Z?

- A It had an accident.
- B It's pointing the way.
- C To confuse squirrels.

A tree's shape tells its life story. This tree snapped when it was young—maybe another tree fell on it, or it bent in an ice storm. But it didn't break completely. The tree recovered and started to grow up again. Native people in North America sometimes bent trees like this on purpose, as markers to point the way to important places. But this one is too young to be an old trail-marker.  A



It's making
a Z for Zia!



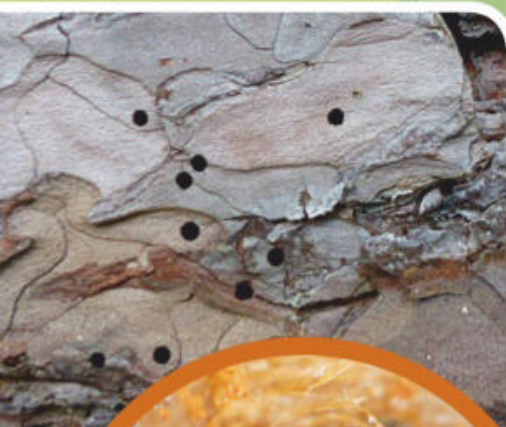


What's that little shelf on the tree?

- A A fungus.
- B A tree oyster.
- C An elf house.

Those little shelves sticking out of trees are bracket fungi, a kind of mushroom. There are many varieties. Most grow on trees or old wood. When you touch them, many feel hard, almost like wood. They help decompose old logs. Squirrels and chipmunks like to nibble on them.

A



What made all those little holes?

- A Squirrels having a pea-shooting contest.
- B Beetles.
- C Birds.

Regular rows of holes on a tree might be the work of sapsuckers. These small woodpeckers punch holes to drink the sap from the tree. But tiny holes scattered all over are probably bark beetles. These beetles lay their eggs in tree bark. Their larvae eat the inside of the bark, then chew their way out. Trees don't like this much!

B or C



Can you really find north by looking at which side of a tree has moss on it?

- A Of course! I saw it in a cartoon.
- B No, moss prefers rocks.
- C Maybe, if you don't mind getting lost.

Mosses are tiny, simple plants. They like damp, shady places. North of the equator, the north sides of trees face away from the sun. So in a sunny field, the north sides tend to be shadier. But in the middle of a forest, any side of a tree might be the most shady. Moss also grows well anywhere water drips. So moss doesn't only grow on the north sides of trees. But...if you compare a lot of trees in a wood, the north sides might, on average, be mossier.

C



I don't know which way is north, but this way is moss.



How did that tree get twisty?

A Too much love from a vine.

B Its branches keep turning to follow the sun.

C Wind.

Vines like to grow up trees. But as the tree grows thicker, the vines don't loosen. They can squeeze the tree, forcing it to grow in a twisty shape. 🍌 A



Why does that stump look melted?

A The tree melted in a fire.

B The stump is still alive.

C Deer licked it smooth.

Usually, when the top of a tree is cut off, the tree dies. But sometimes tree stumps are kept alive by their neighbors. Underground, tree roots sometimes grow together. If one tree is cut down, its neighbor can send it sugar through their joined roots. The stump stays alive, and new bark grows over the stump. 🍌 B



Where are all the animals?

A Hiding.

B There are not as many as you think.

C Right behind you.

On a walk in the woods you may not see many birds or animals. But that doesn't mean they aren't there. Most animals are very good at hiding—that's what keeps them alive. Birds perch where they're hidden by the leaves. You can probably hear many more birds than you can see. And look for signs that animals have been there. 🍌 A



I guess you CAN have too much electricity.

What happened to that tree?

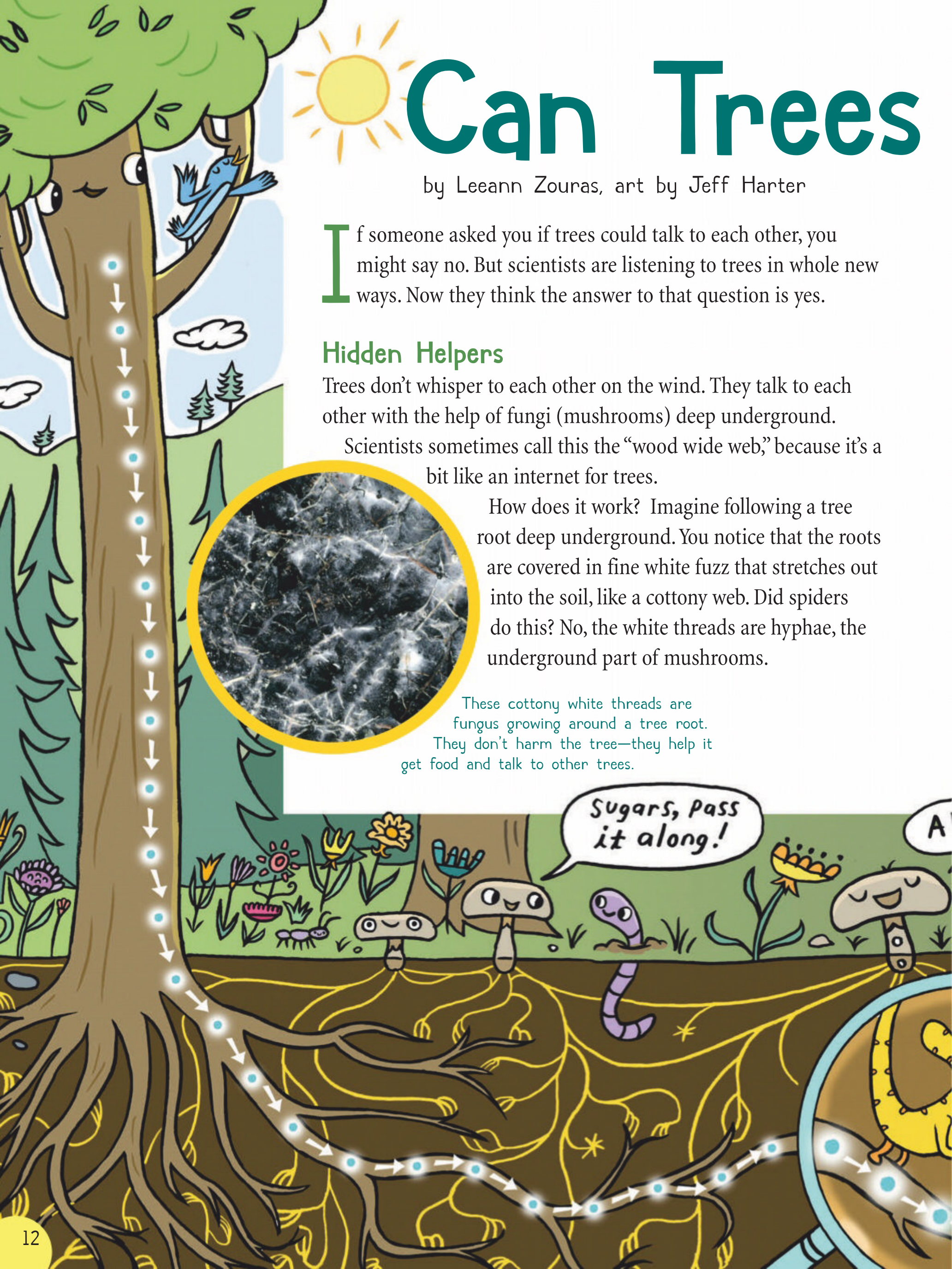
A It got too big and split into two trees.

B A giant with an axe.

C Lightning.

Tall trees are favorite targets for lightning. When lightning hits a tree, the huge jolt of electricity superheats water in the trunk, instantly boiling it into steam. The force of the steam expanding can crack the trunk, knock off branches, or even make the tree burst apart. If the tree is lucky, lightning may just leave a long scar. Over time, new bark will grow over the bare patch. 🍌 C





Can Trees

by Leeann Zouras, art by Jeff Harter

If someone asked you if trees could talk to each other, you might say no. But scientists are listening to trees in whole new ways. Now they think the answer to that question is yes.

Hidden Helpers

Trees don't whisper to each other on the wind. They talk to each other with the help of fungi (mushrooms) deep underground.

Scientists sometimes call this the "wood wide web," because it's a bit like an internet for trees.

How does it work? Imagine following a tree root deep underground. You notice that the roots are covered in fine white fuzz that stretches out into the soil, like a cottony web. Did spiders do this? No, the white threads are hyphae, the underground part of mushrooms.

These cottony white threads are fungus growing around a tree root. They don't harm the tree—they help it get food and talk to other trees.

Sugars, pass it along!

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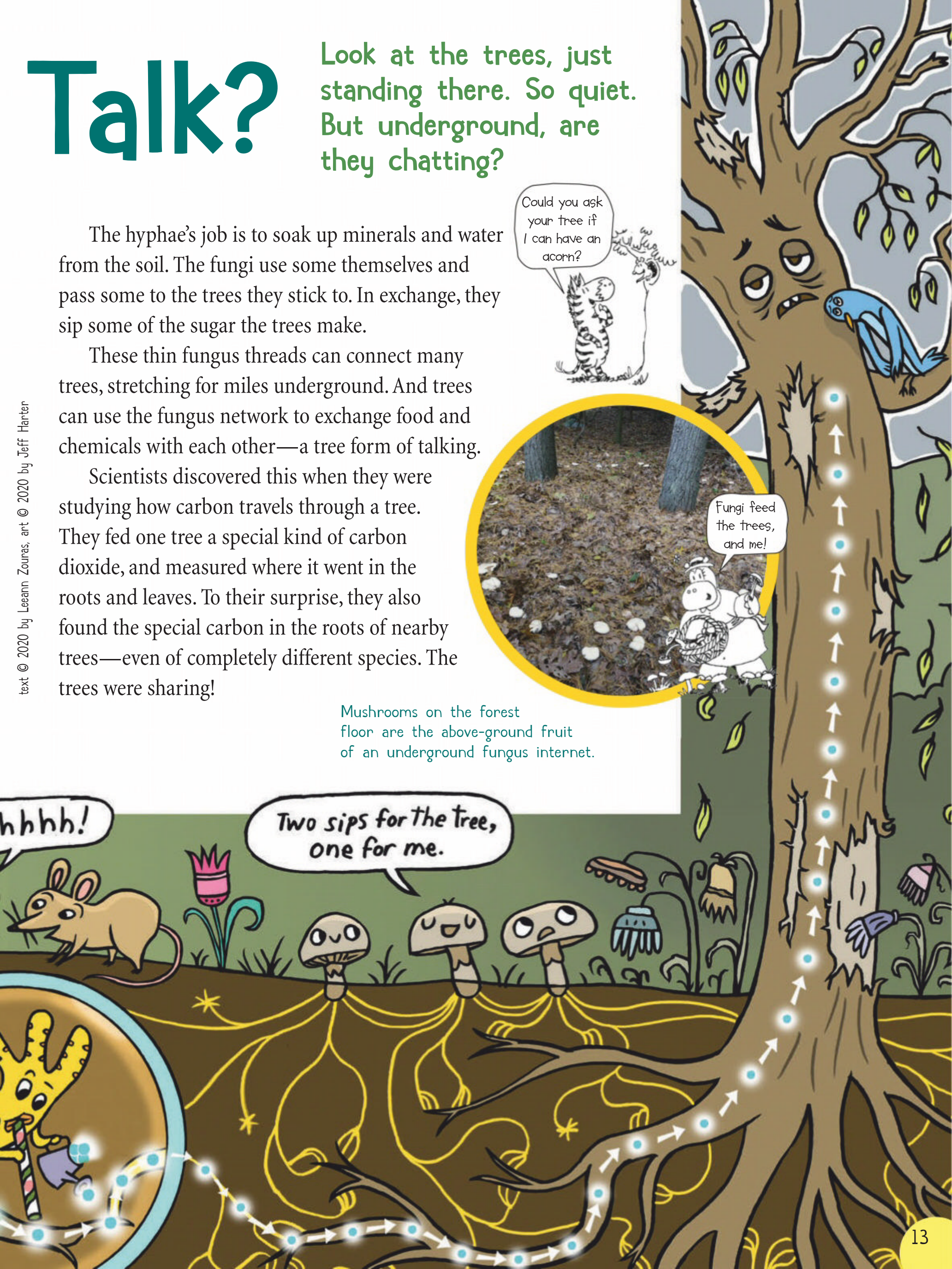
Look at the trees, just standing there. So quiet. But underground, are they chatting?

The hyphae's job is to soak up minerals and water from the soil. The fungi use some themselves and pass some to the trees they stick to. In exchange, they sip some of the sugar the trees make.

These thin fungus threads can connect many trees, stretching for miles underground. And trees can use the fungus network to exchange food and chemicals with each other—a tree form of talking.

Scientists discovered this when they were studying how carbon travels through a tree. They fed one tree a special kind of carbon dioxide, and measured where it went in the roots and leaves. To their surprise, they also found the special carbon in the roots of nearby trees—even of completely different species. The trees were sharing!

Mushrooms on the forest floor are the above-ground fruit of an underground fungus internet.

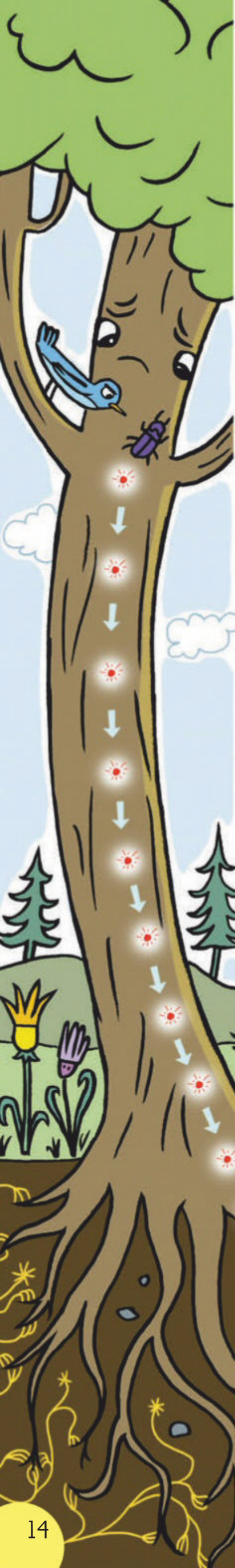




For you!

For you!

Stand Together



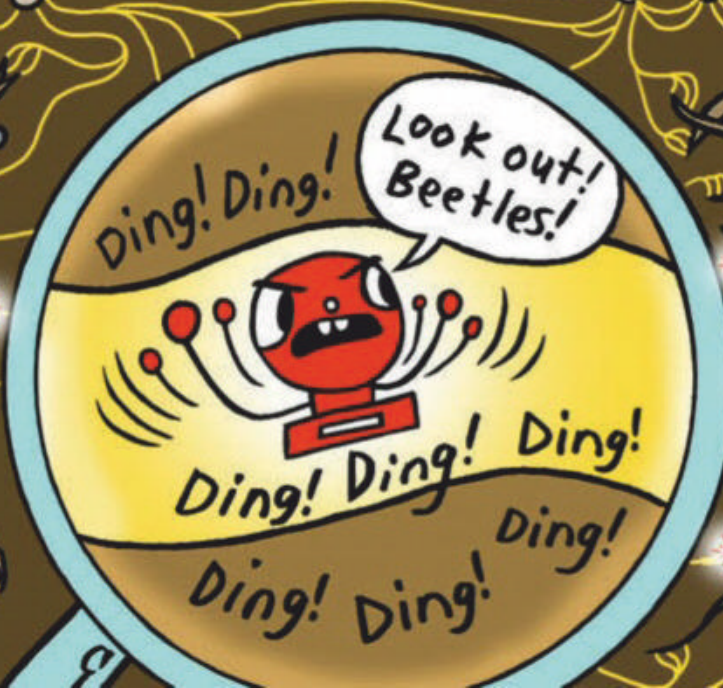
Trees in a forest can use the underground fungus network to help each other. They send extra sugar along to neighbors who are sick or injured or don't get enough sun. They can also use the network to warn each other of danger. If a tree is being nibbled by bugs, it makes bug repellent. Other trees taste this through the fungus network. Then its neighbors also start making poison, before the bugs arrive. That way, all the trees do better.

The biggest trees in a network usually send the most signals. These big, busy trees are called *mother trees*, although they don't have to be female. Mother trees can be linked to hundreds of other trees.

Sometimes trees link roots directly. Neighbor trees often have connected roots. This helps trees stay upright in high winds and lets them share nutrients more easily.

Trees can also sound the alarm with scents. In Africa, when a giraffe munches on an acacia tree, the leaves release ethylene gas. Leaves on other trees breathe in the ethylene. This triggers them to fill their leaves with poison. Giraffes walk right past them and snack on a tree farther away.

So though trees may be quiet giants, they can say plenty, if you know how to listen. 



Ding! Ding!

Look out!
Beetles!

Ding! Ding! Ding!
Ding! Ding!

Old Oak's Advice for Young Acorns

art by Keith Bendis



How can I grow as big as you?

Eat up your carbon dioxide, and try to fall in good soil. If you don't want to tip over, get your roots in nice and deep. And remember, a tree's best friends are really, really small. Bacteria and fungi may not look pretty, but be nice to 'em and they'll give you tons of tasty nitrogen.



Do squirrels tickle?

Them squirrels is tickly. But don't shake 'em off. You need 'em to bury your acorns.



When will I be tall?

You just work on gettin' your tap root down first. Then you'll shoot right up—if a deer don't eat you. Whack its nose if it tries. We oaks can live 1,000 years and never stop growing, so take your time! Up from the top and bigger around the middle, that's the way. Then before you know it you'll be 50, and a real grown-up oak. Heck, I'm only 250, still young!

K. BENDIS



Where can I get a cool tattoo like yours?

Anyone tries to cut their initials in you, you fall over on 'em! What makes people think they can just come and carve on trees, I'd like to know? Really, animals have no manners.



Are you scared of anything?

Boring beetles!



Yeah, beetles can be dull.

No, I mean them itchy little critters that bore into me. Their larvae gnaw under my skin where I can't get at 'em, and they steal my sap! Get yer own sap, I say. Stay away from mine! Gotta get me some woodpeckers—they might drill a hole or two, but they sure do eat up pesky bugs.

Now you run along and grow!





Woodpeckers make new nest holes every year. Many other animals use old woodpecker holes, including bats, owls, and squirrels.

Can you spot any fur or feathers snagged by a branch? You might also find old feathers molted by birds, or hair shed by animals when they change their heavy winter coats in spring.

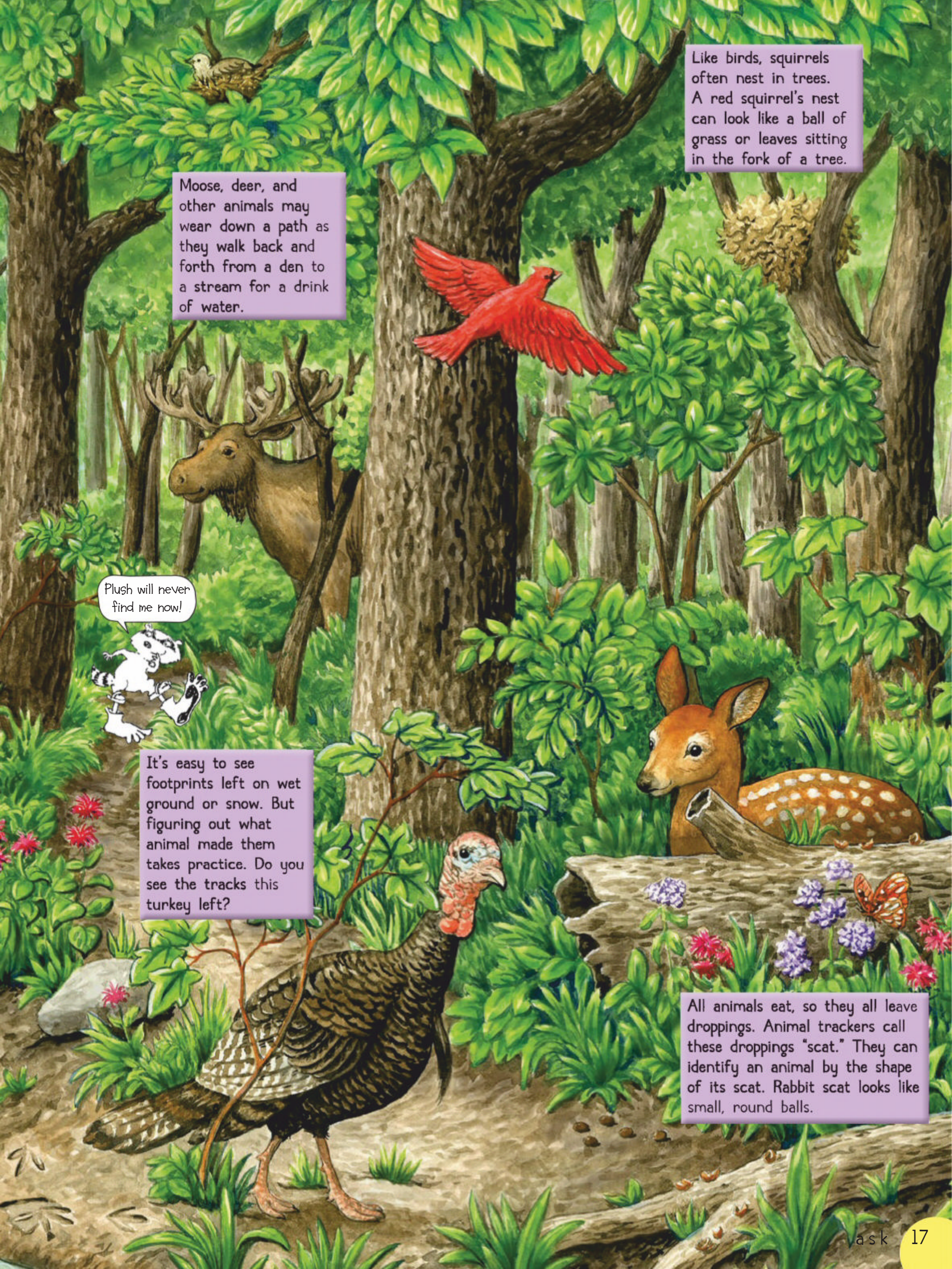
Animals can leave teeth marks on trees when they bite off twigs to eat or chew on branches to clean their teeth. Cougars and bears may leave scratch marks when they sharpen their claws.

Animals are messy eaters. If you see food scraps or nut shells scattered around, you'll know that an animal was nearby not so long ago.

It's not always easy to spot animals in a forest. But if you look closely, you can find clues that they've been there.

art by
Carol Schwartz

WHO'S BEEN HERE?



Like birds, squirrels often nest in trees. A red squirrel's nest can look like a ball of grass or leaves sitting in the fork of a tree.

Moose, deer, and other animals may wear down a path as they walk back and forth from a den to a stream for a drink of water.

Plush will never find me now!

It's easy to see footprints left on wet ground or snow. But figuring out what animal made them takes practice. Do you see the tracks this turkey left?

All animals eat, so they all leave droppings. Animal trackers call these droppings "scat." They can identify an animal by the shape of its scat. Rabbit scat looks like small, round balls.

Porcupette Explores the Night

by Susan Yoder Ackerman
art by Diane Blasius

The full moon is rising over rocky mountain peaks. It shines down into a canyon. Under the roots of an old pine tree, there is scuffling and snuffling. A young porcupine, called a porcupette, comes out of the den where she spent the day resting. Her mother is still asleep in the branches above.

Porcupette looks awkward as she slowly waddles on her short, sturdy legs, but she is calm and confident. She is not bothered when a raccoon trundles past her on its way to fish in the nearby stream. She is not afraid to come out at night alone.

Nighttime is
the best time
for mischief.

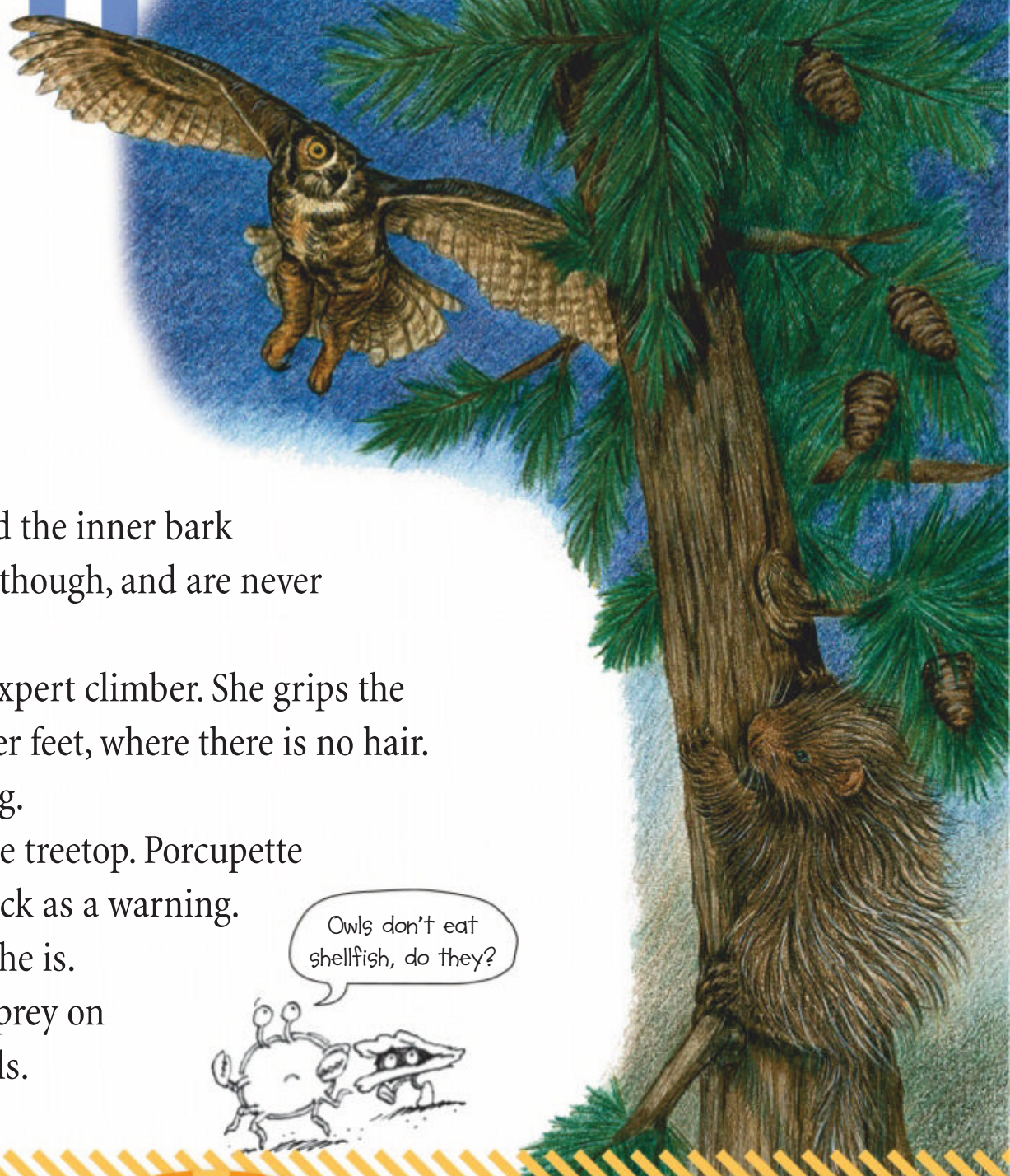


Baby porcupines stay with their mothers for about 4 months, until they're big enough to take care of themselves.

Right now, Porcupette is hungry. Mother's milk is good, but porcupines are born with a mouth full of teeth and ready to bite. Porcupette is looking for something to chew on. Clover would be nice, but it isn't always easy to find. Pine needles and the inner bark of the pine tree make a good snack, though, and are never too far away in the forest.

Lucky for Porcupette, she is an expert climber. She grips the tree trunk with the rough soles of her feet, where there is no hair. Her long, curved claws pull her along.

A great horned owl calls from the treetop. Porcupette stops and raises the quills on her back as a warning. It makes her look a lot bigger than she is. The owl takes off on giant wings to prey on smaller animals that don't have quills.



A Coat of Quills

If you met Porcupette, the first thing you'd notice would be the long yellowish hairs that flare out over her brownish-black fur. She looks like she's wearing a costume wig. You might be tempted to pet her, but don't do it! Mixed in among the soft hairs are 30,000 sharp, stiff quills. Porcupine quills grow to be four inches long. They are made of keratin, like our own hair and fingernails. But the tip of each quill is covered in barbs—tiny, backward-facing hooks that pierce skin easily and make the quill hard to remove. Enemies, beware! Other porcupines need to be careful too. A porcupine that accidentally gets a quill stuck in its foot will have to tug it out with its teeth.



This is the surface of a porcupine quill seen up close. It's covered with backward-pointing barbs that make it extra painful to pull the quill out.



But with a sharp surprise!



Porcupette backs down the tree and wanders over to the nearby stream. She slips in, searching for tasty water plants. She's a good swimmer. Her quills are hollow, and that helps her stay afloat.

Wow, their quills are both armor and weapon!



And a swim float!



A beaver glides past her in the night. Beavers are the biggest rodents in North America, but porcupines aren't far behind. In fact, when Porcupette was born, fully covered in blackish fur, she already weighed about a pound—bigger than a newborn black bear! It took only a few hours for some of her soft fur to harden into quills. When grown, Porcupette will weigh about 14 pounds and measure almost 3 feet in length.

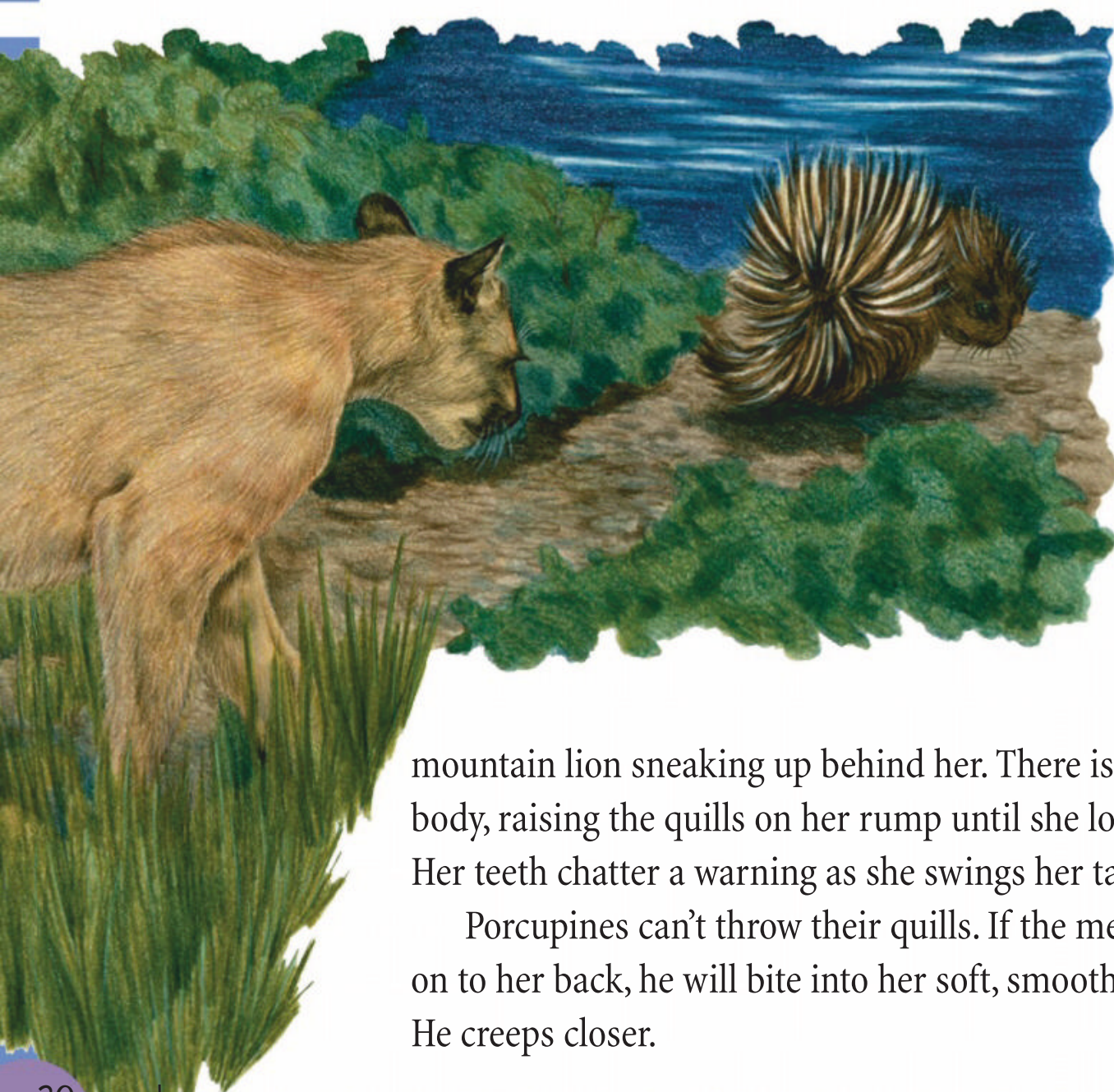


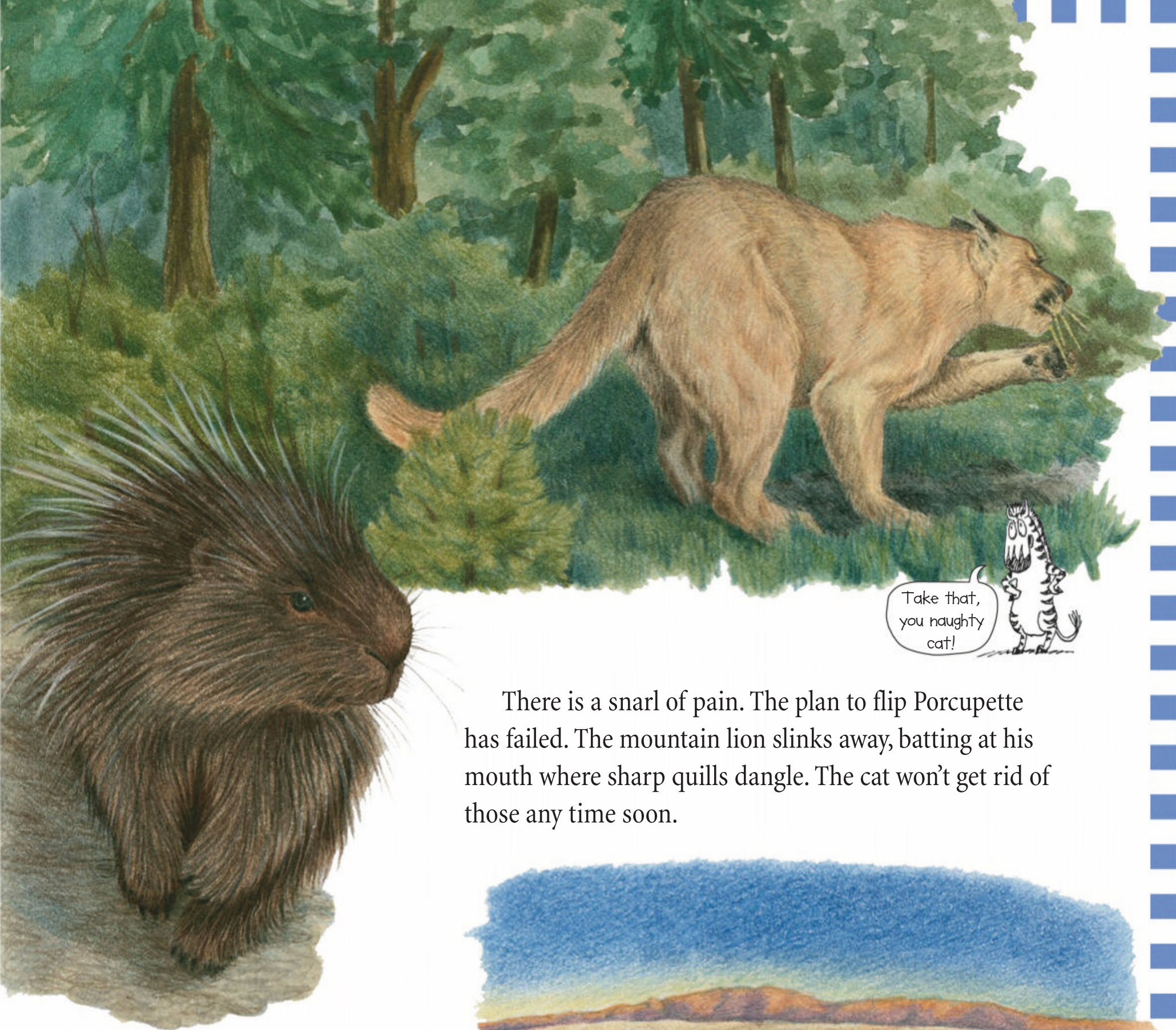
Porcupines can't shoot their sharp quills, but the quills are loose and come out easily.

Porcupette pulls herself out of the stream. She sniffs the air, checking it for treats. A bit of salt might be found on a canoe paddle. She could gnaw on bones or antlers lying around in the forest, to enjoy their tasty minerals. That would be the perfect end to a night of nibbling.

Suddenly Porcupette catches the strong odor of a mountain lion sneaking up behind her. There is no time to lose. She shakes her body, raising the quills on her rump until she looks like a giant pincushion. Her teeth chatter a warning as she swings her tail back and forth forcefully.

Porcupines can't throw their quills. If the menacing cat can flip Porcupette on to her back, he will bite into her soft, smooth stomach where no quills grow. He creeps closer.





Take that,
you naughty
cat!

There is a snarl of pain. The plan to flip Porcupette has failed. The mountain lion slinks away, batting at his mouth where sharp quills dangle. The cat won't get rid of those any time soon.

Morning is coming. Time to rest! Porcupette finds a large boulder to nestle under. Soon she is fast asleep, dreaming of more adventures in her prickly porcupine world. 🦔



Ah, morning—
the perfect time
for a nap!



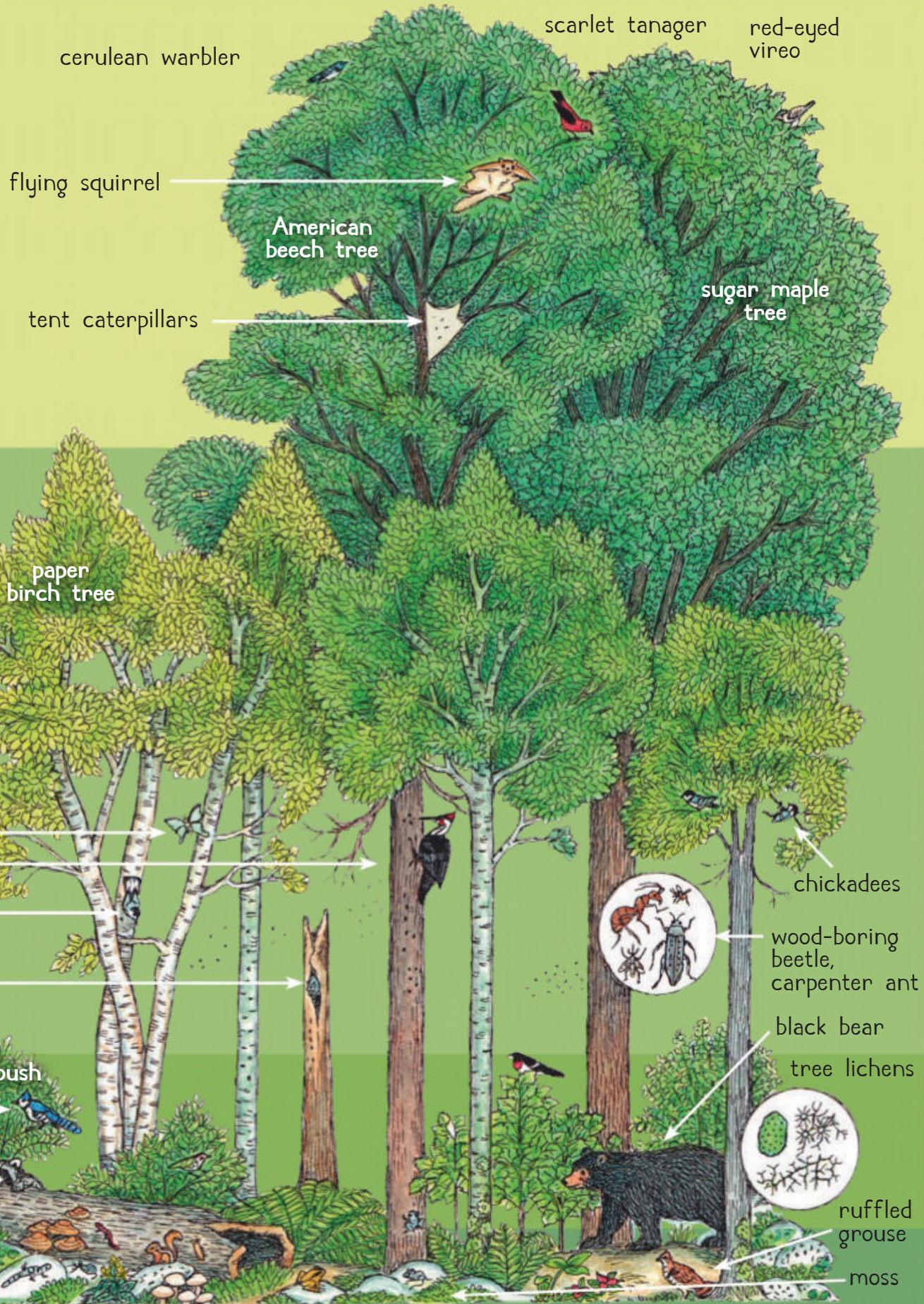
Broadleaf Forest

Forest

Look up! Life in the woods is lived on many levels. At the top, the sunny canopy is open to the wind and weather. Moving down, each level of a forest gets a different amount of light and water. Every level has its own community of birds, animals, insects, and plants. There are also many kinds of forests. In a broadleaf (or deciduous) forest, trees shed their leaves every year.

CANOPY

UNDERSTORY



SHRUB

FOREST FLOOR

UNDERGROUND ROOT SYSTEM

deer mouse

fungi

soil bacteria

Layers

art by Patricia Wynne

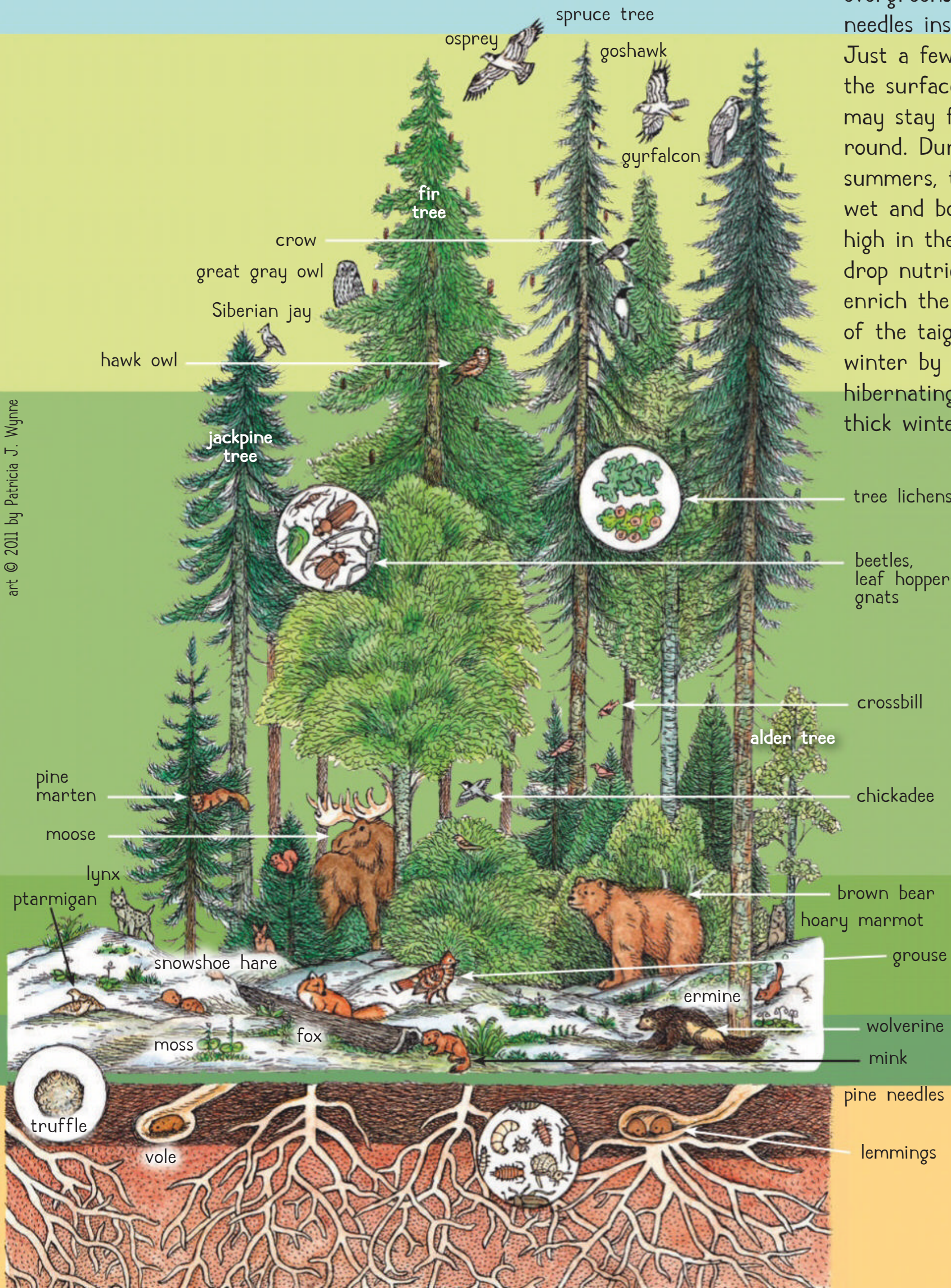
So many trees,
so little time!



Boreal Forest (Taiga)

In cold northern forests, many trees are evergreens. They have needles instead of leaves. Just a few feet under the surface, the soil may stay frozen all year round. During the short summers, the ground is wet and boggy. Lichens high in the treetops drop nutrients that enrich the soil. Animals of the taiga survive the winter by migrating, hibernating, or growing thick winter coats.

And there's
even more
creatures too
small to see!



Stop and Listen

What is the sound of your woods?

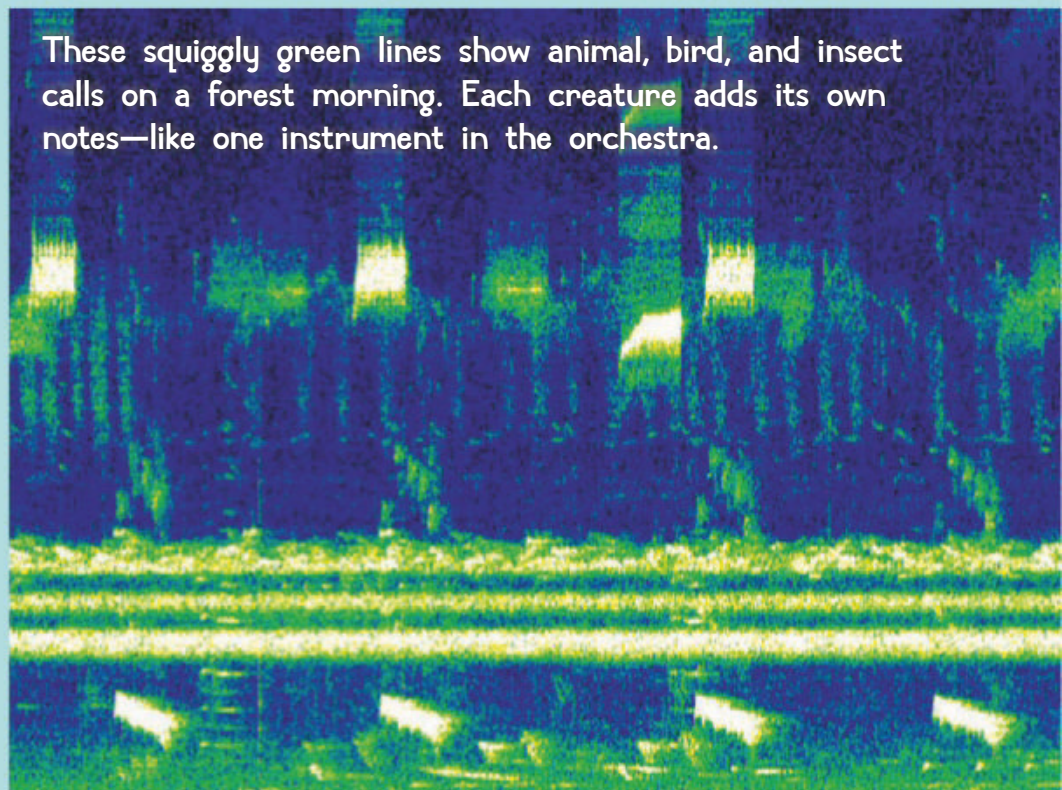


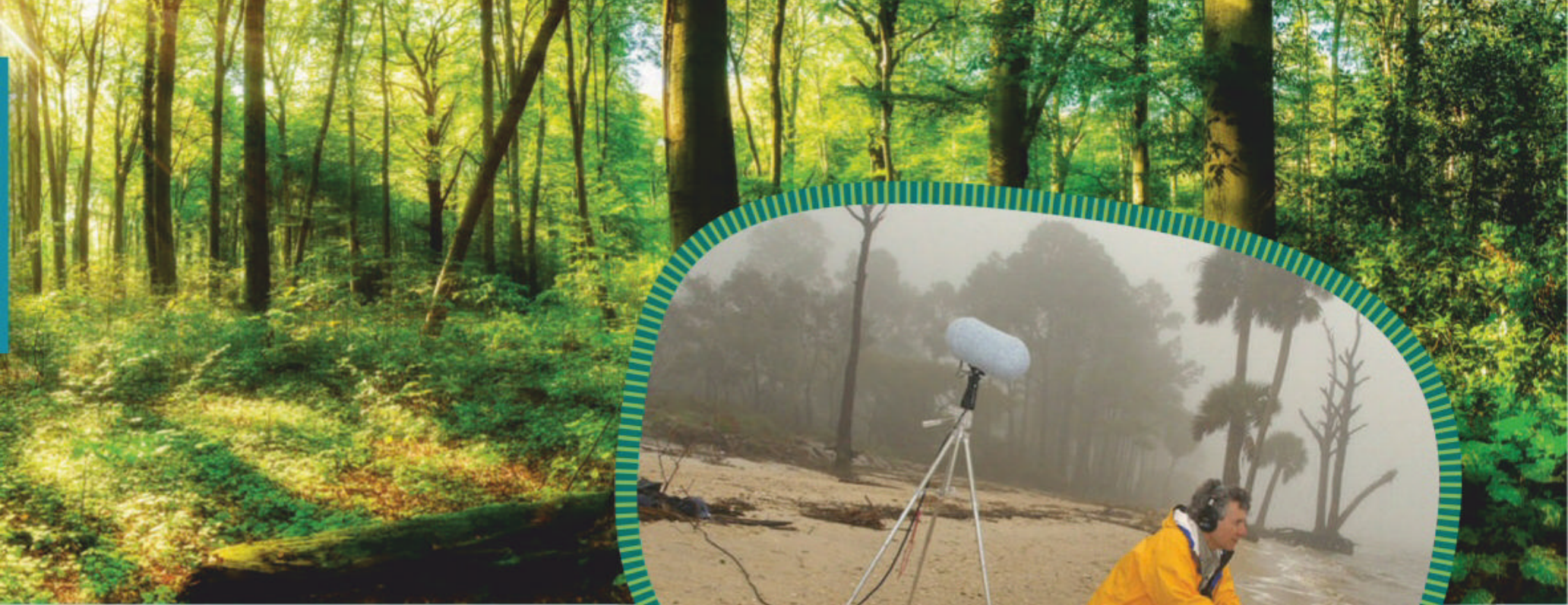
Bernie Krause is a musician. But his favorite sounds are made by nature.

Bernie Krause likes sounds. When he was a young man, he played guitar and sang with a famous music group called the Weavers. Then he got interested in electronic music, made with computers. And from there, he started making sound effects and music for movies.

Sometimes, Krause uses natural sounds as part of his music. The sound of waves crashing, or birds singing, or the wind in the trees. He went out with his microphone and

These squiggly green lines show animal, bird, and insect calls on a forest morning. Each creature adds its own notes—like one instrument in the orchestra.

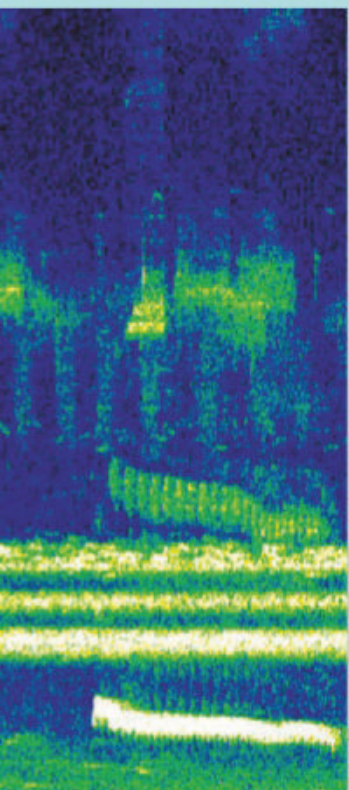




recorded interesting sounds to put in movies or to use in his own songs.

As he sat in the woods with his microphone, Krause started thinking about the music that the whole forest made. Instead of trying to capture just the sound of one animal or bird, what could he learn by listening to the sound of everything all together—the animals, the trees, the wind, the earth itself? He called these recordings “soundscapes”—the sound of a particular place.

Back in his studio, Krause used a computer to make a picture of all the sounds going on in a place. Each animal, bird, and insect had its own place on the graph—its own notes in the music. The busier the picture, the richer the life in that place.



Krause spent many years traveling around the world, recording the soundscapes of tropical forests, meadows, deserts, mountains, seashores, and rivers. Sometimes, he went back many times. And he noticed changes.

In one forest meadow, he made two recordings several years apart. In between, a logging company had come and cut down only a few of the biggest trees. The woods didn't look different. But it sounded different. When Krause listened to the second recording, he noticed that there were fewer birds, and not as many kinds. His sound pictures showed that although the forest might look the same to humans, it had lost part of its orchestra.

So the next time you're out in the woods, try another way to look—shut your eyes, and listen. Who's there? 🦉

Does the seashore sound different on a foggy day?

Wow, those crickets can really groove!



A Liking for

by Lisa Spencer



Is it an alien?

What's the crusty stuff growing on that tree?

Look, here's some more on a rock. And on this railing. Here are some patches that look like coins. Is it alive? And what is it?

Lichens

This mysterious flaky growth is lichen. Lichens can be fluffy, leafy, bumpy, frilly, powdery, jelly-like, or crusty. Some kinds hang from trees like beards. Others resemble moss, mushrooms, coral, antlers, trumpets, or octopus suckers. They come in a wide range of colors. Some even glow.

Lichens come in an astonishing variety of shapes and colors. Here are a few of our favorites.



Greenshield lichen



Pink earth lichen

Perfect Partners

But what are lichens? They look a bit like plants, but they're not. In fact, lichens are not one thing. They are a partnership between two very different life forms. A lichen is a fungus that grows together with algae, cyanobacteria, or yeast. It takes both partners to make a lichen—it won't grow if one is missing.

Under a microscope, a lichen looks like a tangled spiderweb with balls stuck in it. The balls are single cells of algae or cyanobacteria. The web is the thin threads of the fungus, making a house to hold its partner.



This is lichen under a microscope. The green balls are algae, and the white net is a fungus.

Why do they partner up? Algae and cyanobacteria can make sugar from sunlight, air, and water. Fungi can't do this. They have

to get their sugars from plants or animals. In a lichen, the fungus traps algae to make sugars, like a live-in baker. In return, the fungus protects its single-celled pals, and gives them water and minerals that the fungus pulls from rock and soil. Together, lichens can thrive in places where each partner could not survive alone.

Each type of lichen has a different fungus partner. You can find lichens growing on rocks, tree bark, soil, wood,

Two are better than one!



Know Your Lichen

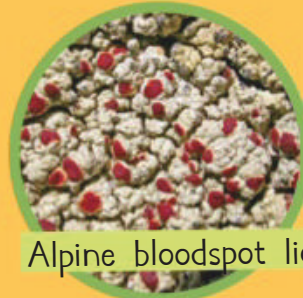
Lichens are sometimes divided into groups based on shape.

Crusty (crustose)

Grow flat. Some spread out like coins or rust spots. Others look like curdled milk.



Golden moonglow lichen



Alpine bloodspot lichen

Leafy (foliose)

Have flat leaves. These can be quite small or pretty big.



Green dog lichen



Oakmoss lichen

They don't look anything like mushrooms!



Fungus gets strange with a partner.

Fruity (fruticose)

Have stalks. These can be long and thin, or short and cup-shaped, or knobby.



Toy soldiers lichen



Western antler lichen



glass—and even old cars. Lichens grow on every continent, and in almost every climate. They thrive in rainforests, in deserts, on bare mountain tops, and in icy Antarctica. Lichens can even survive in outer space. One hardy colony lived for 18 months outside the International Space Station.



This is not a lichen—it's a katydid disguised as a lichen to hide from birds.



Several kinds together



Yellow scale lichen



Cup lichen

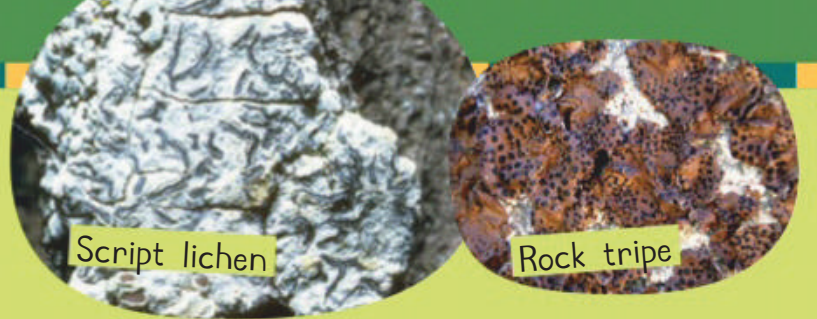


Rock jewel lichen

Moss or Lichen?

Is that green patch lichen or moss? Though they look similar, they are very different!

Lichens are a fungus living with algae. But moss is a plant. Moss is usually bright green, while lichens can be any color. Moss feels soft and damp when you touch it. Lichen is more rubbery. But moss and lichen both like to grow (very slowly) on trees and rocks, so they often grow together.



medicines were used to treat all kinds of infections, from sore throats to skin rashes. Lichens are full of natural bacteria-fighting chemicals, so lichen cures really worked. Modern doctors still study lichens to find new medicines.

Lichens even absorb pollution from the air—up to a point. If there's too much pollution, they will die. So lichens can be used to measure air quality. If they start to vanish, that's a warning sign.

You might have lichen products at home. They are used to make deodorant and toothpaste, to dye cloth, and in some perfumes.

So the next time you see a lichen, take a moment to appreciate the power of true friends. 🦋

And it also makes a great hat!



comic by Tom Gauld

Like Your Lichens

Lichens are small, but they are important to all life on Earth. They are often the first to grow on new islands and other bare rock. Lichens break down rocks to make soil for plants. And once they've helped make the soil, lichens help keep the soil in place.

Soft lichens are a popular nesting material for small birds. Many animals also eat lichens. In winter, lichens under the snow provide important food for caribou, squirrels, and small rodents.

Since ancient times, humans have used lichens to make dyes and medicines. Ancient Egyptians used lichens to keep mummies from smelling bad. Lichen



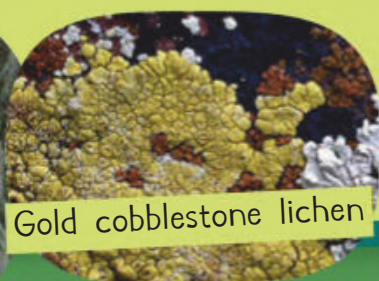
Christmas wreath lichen



Shield lichen



Old man's beard



Gold cobblestone lichen

Peter Rabbit Likes Lichens

Before she wrote *Peter Rabbit*, the author Beatrix Potter thought about becoming a botanist. She especially liked lichens. She collected them in the woods around her home, looked at them under a microscope, and drew careful pictures. She was one of the first people in England to support the new idea that lichens were not one organism, but two. Her careful looking convinced her.



Hey, Sage! Ms. Hilliard's second grade class wants to know, what is gum made of and how is it made?

Gum is chewy, but it isn't food. So what is it?

Today, man-made rubber (or latex) is the main ingredient in chewing gum. Manufacturers add sweeteners, flavor, and softeners to the rubbery base. Then they roll it out, dry it, and cut it into pieces.



1. Cook ground-up gum base with sugar or other sweeteners, flavoring, and softeners.



2. Stir and knead until smooth and stretchy.

3. Roll into a flat sheet.



4. Score with lines and dry.



5. Snap into pieces and wrap.



So who invented gum?

That's hard to say. People all over the world have been chewing on beeswax and tree sap since the Stone Age.



Birch bark tar was our favorite chew. Also handy for fixing spears!



Scandinavia, 9,000 years ago

We chewed spruce tree resin. And used it to waterproof our canoes, too.



Ancient North America

We chomped on chicle from sapodilla trees.



Ancient Maya

So everyone invented it?

Looks like! Though bubble gum was invented in 1928 by a man named Walter Diemer.

I made it pink because that was the only color I had!



Ancient Aztecs

Only children and unmarried women may chew gum in public. Married women must chew at home, and men, no chewing!



But we chew secretly to clean our teeth.

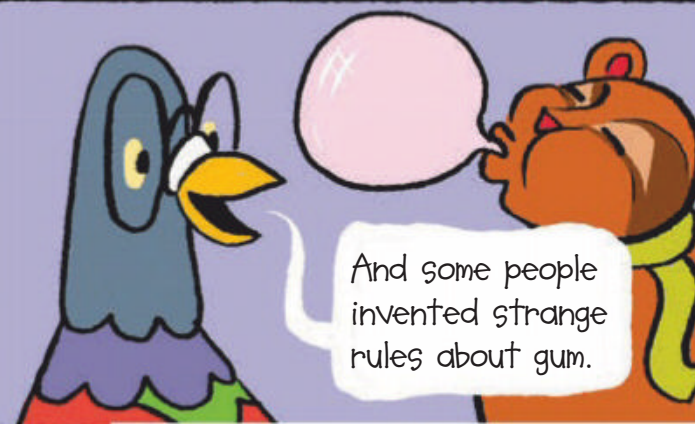
Glad we don't have any gum rules.

Except, of course, no gum in school.



And don't spit it on the sidewalk!

And some people invented strange rules about gum.



ASK US ANYTHING!

WRITE TO US AT:
ASK
70 EAST LAKE STREET
SUITE 800
CHICAGO, IL 60601
OR HAVE YOUR PARENT email
ASK@CRICKETMEDIA.COM



CONTEST AND LETTERS

In our October issue we asked you to imagine yourself with a light-up body part. Thanks to all you illuminating imagineers for sharing your glam!

Send your letters to Ask Mail,
70 East Lake St., Suite 800, Chicago, IL
60601, or have your parent/guardian
email us at ask@cricketmedia.com.



Cleveland M., Arizona

*I have bioluminescence
hands so I can swim in
the pool at night.*



August W., age 8,
Illinois



Woody, age 8, Maine



Lilit L., age 8,
by email

*With my glowing eyes I
could pick grapes in the
dark.*

Dear Marvin,
I have a new prank for you.
On April Fools Day, put ice in
Plush's pillow before she takes
a nap.

Your prankster friend,
Thomas H., age 8,
Wyoming

Dear Thomas,
Thanks for the early warning.
I'll be sure to check all my
bedding *VERY* carefully.
Plush the Vigilant

Dear Plush,
Hey, no peeking!
Marvin

Dear Avery,
How much wood would
a woodchuck chuck if a
woodchuck would chuck wood?
Chuck
In the woods

Dear Chuck,
If a woodchuck would chuck
wood, it would be a beaver.
Woodchucks (or groundhogs)



Gemma R.A., age 10,
Maryland

*I would like light-up hair.
I would use it to fix my
hair at night and look
cool.*



Fire Girl

Lindsey F., age 8,
Pennsylvania



Lucy Z.,
age 7,
California



The Bioman

Neil P., age 9, Utah



Netia, age 7,
by email

*My heart glows to
spread love.*

Neon Thoughts

Tali B., age 9,
Washington



Trevor J., age 8,
Florida

The light is like the sun.

*eat grass. They live on prairies
with few trees, so even if a
woodchuck would chuck wood,
it might not find any. So I
don't think this rhyme has its
facts straight at all.*

*Reflectively,
Avery*

So...it would chuck
what wood a wood-
chuck would chuck,
If a woodchuck would
chuck wood?



Dear Watson,
What's your favorite book?
Mine is called *Dinosaur Atlas*.

Love, Keegan G., Texas
P.S. My nose is completely in
a book.

Dear Keegan,
The Dinosaur Atlas sounds
very interesting! I hope
they don't bite your nose!

*I've recently been reading up
on creatures even older than
dinosaurs. Some of them are
really strange-looking! Squid with
shells, giant sea scorpions, tree-
sized mushrooms... Hmmm, maybe
we need to do a magazine about
them.*

*See you on the last page!
Watson*

March Contest

Finding Faces

People often see faces in trees as they walk in the woods. In fact, this is a trick of your brain—our minds look for faces everywhere, and often find them! Seeing faces in things even has a name, *pareidolia*. For this month's contest, snap a photo of a face you see in some inanimate object. It could be a tree, or a plug, or the shape of a door handle—who's watching you?



Contest Rules:

1. Your contest entry must be your very own work. Ideas and words should not be copied.
2. Be sure to include your name, age, and 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. Your entry must be signed or emailed by a parent or legal guardian, saying it's your own work and that no one helped you, and that Ask has permission to publish it in print and online.
6. For information on the Children's Online Privacy Protection Act, see the Privacy Policy page at cricketmedia.com.
7. Email your photo to: ask@cricketmedia.com, or mail to: Ask, 70 East Lake St., Suite 800, Chicago, IL 60601. Entries must be postmarked or emailed by March 31, 2020.
8. We will publish the winning entries in an upcoming issue of Ask.



2020 Spark!Lab Dr. InBae and Mrs. Kyung Joo Yoon

Invent It Challenge

This Year's Challenge: *Create an invention that improves access to healthy food for everyone, everywhere, every day.*



Submit your invention idea by **April 10, 2020**. No purchase necessary to win.

For entry information, go to inventitchallenge2020.epals.com.



Smithsonian





What did the beaver say to the tree?

It's been nice gnawing you!



What kind of tree can fit in your hand?

A palm tree!



How can you identify a dogwood tree?

By its bark!



How many oranges grow on a tree?

All of them.

Who wood laugh at that? No one, I be-leaf.

What acorn-y joke!



Why can't maple trees sew?

They have no needles.



How do trees surf the internet?

They log on.



What do you call a tree that grows meat?

Dmitri.

Dmitri?

De-meat-tree!



What's the same size and shape as an oak tree, but weighs nothing?

An oak tree's shadow!

