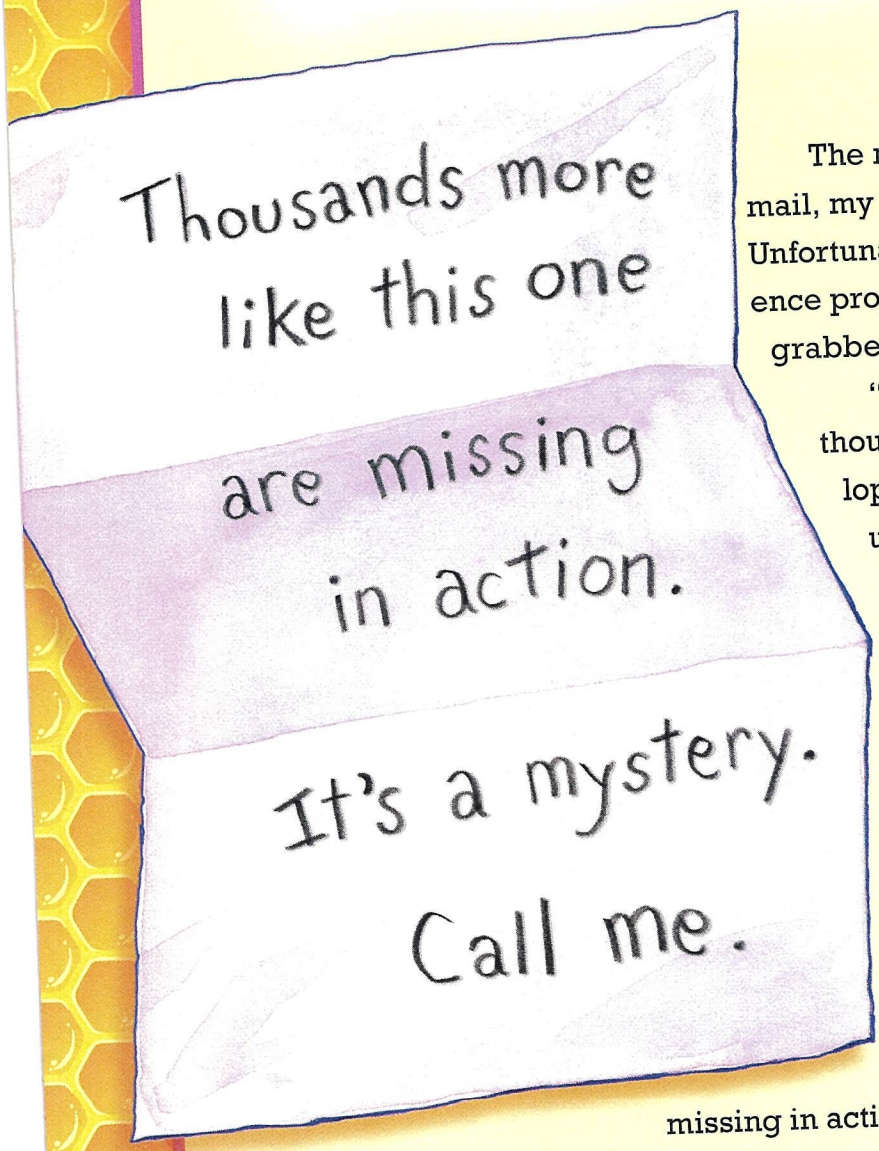
Lesson 28

Vanishing Act



The morning the dead bee arrived in the mail, my mind was already buzzing with ideas. Unfortunately, none of them were about my science project. The letter addressed to me had grabbed my attention.

"A note from my cousin Justin," I thought at first. I nearly tossed the envelope aside, but Justin's handwriting was usually close to impossible to read. This was unusually careful and clear. I opened the envelope and unfolded the piece of blue paper inside. A bee carcass fell on my desk.

At least I thought it was a bee. I always have a hard time telling apart flying, stinging insects–such as wasps, hornets, and bees–when they're alive. A dead one was even trickier to identify. The note said:

"Thousands more like this one are missing in action. It's a mystery. Call me."

No signature on the note. But it was from Justin. I was sure of it.

I found a magnifying glass and studied the dead bug my cousin had sent. I compared it to images in the encyclopedia. I learned that wasps always have yellow and black stripes, whereas honeybees are often a golden brown. Since bees in cartoons are almost always yellow-and-black striped and cute, you can understand my initial confusion. But the dead insect was definitely a honeybee. I picked up the phone to call Justin.

"Hey, stop sending dead stuff to me," I said when he picked up.

"It got your attention, didn't it?" he replied.

"What's going on?" I asked.

"I'm at Grandpa Ray's farm. When we got here on Friday night, he was having a fit because the hives he rented were empty," Justin said.

"Wait a second. Your grandpa rents hives?" I asked. Justin's Grandpa Ray wasn't my grandpa but I'd been to his farm dozens of times. I'd learned a lot about farming from the visits, but I had no idea what Justin was talking about. "Empty hives?"

"Yeah, lots of farmers rent beehives," Justin said, clearly impatient with me. "Grandpa has beekeepers bring hives here every February for the almond harvest. All the farmers do it. Grandpa said they need millions of bees to pollinate the crops. And that's just for the almond orchards."

Raising bees was a much bigger business than I'd imagined. Our class went on a field trip to visit beekeepers when we were in fourth grade. We learned all about pollination from a beekeeper who wore what looked like a white space suit that completely covered her.

The insect carcass fell out of the envelope. On close inspection, I determined it was, indeed, a dead honeybee.

I was mostly interested in the beeswax candles and jars of honey that they sold in the gift shop, so I kind of forgot that bees have a bigger job in the scheme of things. If honeybees don't pollinate plants, those plants won't reproduce and make seeds for new plants. Farmers could get desperate for bees.

"I need you to come out here and take a look. I need you to be my eyes," Justin said.

"What *I* need to do is to come up with an idea for a science project. And it can't be just one of my regular kind of brilliant ideas. This has to be *especially* brilliant because the whole town will see it at the science fair. If I don't have something by dinner, Mom will ground me and I'll never get to see you again," I said.

"Tia," Justin said with a long, dramatic sigh. "Don't you get it? This *is* your science project. That's why I wrote to you."

"What about my keen observational skills?" I asked.

"That too."

Justin was a year ahead of me in school and he knew all about the required sixth-grade independent science project. He was right. An investigation into the missing honeybees *did* sound like a good science project.

I'd seen a beekeeper in full protective gear.

When Mom got back from the store, we decided to take a trip to the farm. I called Justin and arranged to meet him there in the afternoon.

When we arrived at the farm, Mom went into the house to visit Grandma Ray. Grandpa Ray took Justin and me out to the orchards, narrating our walk as if we were being filmed for a TV nature program. "Bees pollinate more than 90 crops in the U.S. We bring them in every spring for the almonds. We use them for avocadoes, cherries, and kiwis, too. But look what we have here." He stopped at a hive, poking it with a stick. "Go ahead and look. Believe me, nothing will hurt you."

I peered inside.

"It's empty," I said, taking a photograph.

"Exactly," Grandpa Ray said.

"Would someone steal them and then sell them or rent them to another farmer?" I asked.

"Seems like they'd need to take the whole hive in order to make any money," Justin commented.

"I'm afraid some young yahoo is trying to cause trouble. Probably doesn't realize that without bees there won't be as much food," Grandpa Ray said. "So much of what we eat wouldn't be possible without honeybees. In California, the almond crops alone are worth about two billion dollars."

Justin was right: There were no bees at home in this hive.

"Maybe someone is either intentionally–or unintentionally–poisoning honeybees," I suggested.

I asked Grandpa Ray what kind of fertilizers and pesticides he used on his farm. He assured me his farm used only organic fertilizer and that he absolutely would not allow pesticides on food crops.

"It's possible that someone else might be adding something poisonous, however," I said.

"If something was killing the honeybees, you'd think I'd have millions of dead bees around here, but I don't. Where did they go? How could they just vanish?" Grandpa Ray asked.

I told Grandpa Ray that I'd like to study the case of the missing bees for my science project. I thought maybe I could answer some of our questions. Grandpa Ray grinned for the first time that afternoon and said, "Tia, I'll give you a quart of honey if you can figure out where they went."

That made me smile. Justin's grandpa knew how much I loved honey.

I knew that bees pollinate fruit trees, like this bee on a cherry blossom.

I started on my project right away and began by taking several dozen photographs around the farm as well as the surrounding landscape.

Was it crazy to think someone would intentionally steal or kill honeybees?

When we got back to the farmhouse, I hooked my camera up to Justin's laptop so I could look at the photos I'd taken.

"Tell me what you see there," Justin said, moving his head so he could see from the corner of his eye. Justin's legally blind, but that doesn't mean he's totally blind. He has peripheral vision, which means he can see things off to the side. It takes people a while to get used to how he moves so that he can see their faces. He uses a computer all the time, but it would be next to impossible for him to see any details that would be in the photographs that I just took. I zoomed in on one photo.

"What do you see?" Justin asked, leaning in.

"It's what I don't see," I said. "It looks like a large electricity transmitter, but there aren't any wires going into it or coming out of it."

"Sounds like a cell site," Justin said.

"A sell sight?" I asked. "What's that?"

"For cell phones. They pick up cell phone signals." Justin launched into a long description of how my cell phone worked. My mind was elsewhere.

Could this be a clue?

Justin knew it was a cell site in my photo. Could cell phone signals interfere with honeybees?

Almond orchards in California produce a harvest worth two billion dollars each year.

When we got home, I told Mom I was off to research the disappearance of the honeybees. In just a couple of hours of online research I learned that our county wasn't the only one with missing honeybees. Since the fall of 2006, about half of the states reported dramatic declines in the number of honeybees. Estimates were that some commercial beekeepers had lost between thirty and ninety percent of their honeybee colonies. That's a huge range, but even losing thirty percent of these hard-working pollinators could be destructive for farms and, later, for people. Reports were also coming in from Germany, Spain, Greece, and other countries that beekeepers were losing hives.

The buzz about honeybees was that the bees were dying.

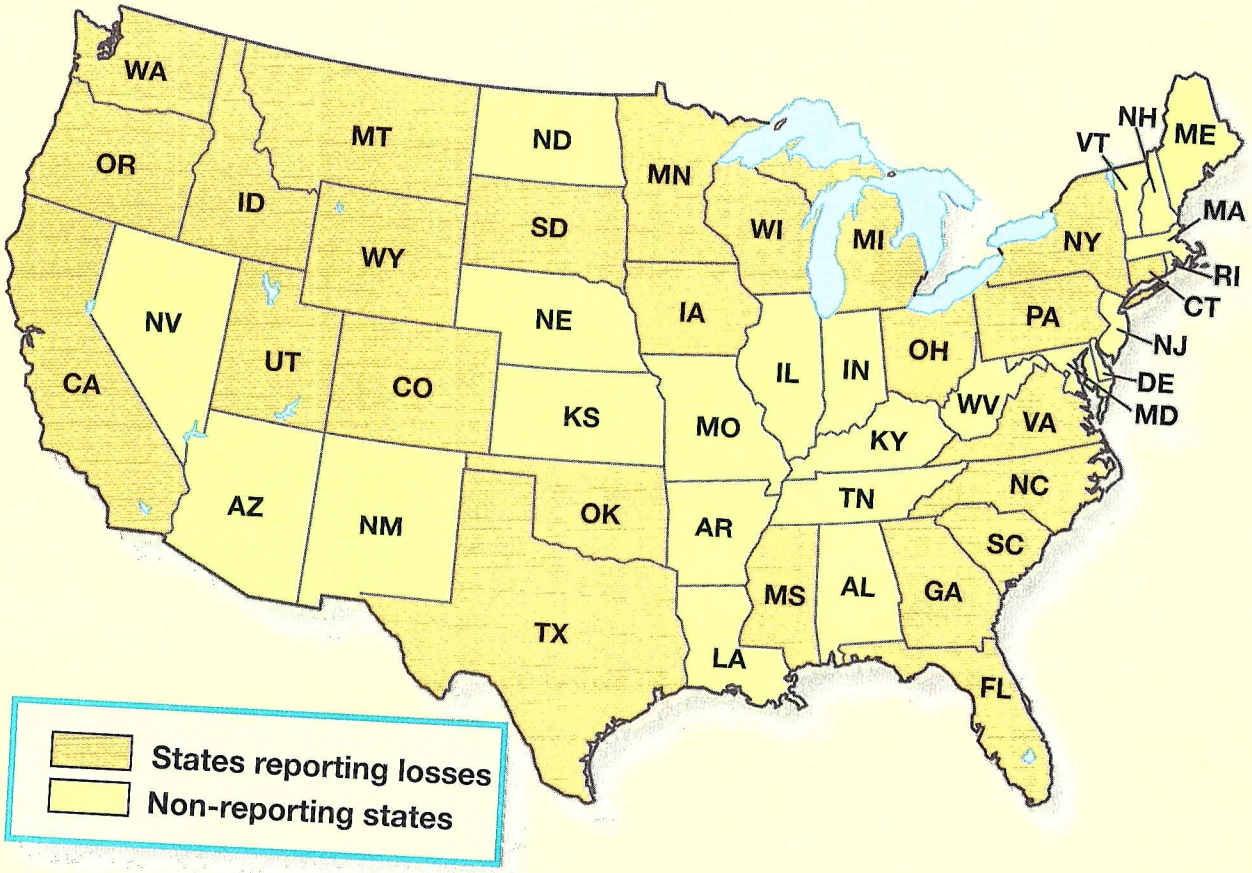
This case sounded more serious all the time. I started thinking about what the disappearance of the bees might mean. I wondered if there would be any more honey for sale. I wondered how people would be affected by a big decrease in the number of fruits and nuts available. It seemed like those foods would definitely get more expensive. It also seemed that I might not get honey for my morning toast even if I figured out what happened to the bees. What if they were just gone forever?

I spent the next several months researching why the bees had disappeared. I also decided to title my science project "Vanishing Act: The Mystery of the Disappearing Honeybees." My title was a little more interesting than "Colony Collapse Disorder" (CCD), which is what scientists had officially dubbed the phenomenon. Cell phone towers, certain pesticides, and drought were at first possible culprits for CCD. Eventually all were ruled out.

By the time I presented my science project at the end of the school year, the best theory available was that a virus had caused bees to weaken and, eventually, die. Some bees may have left the hive and then became too weak to pollinate or to return.

I scored a 98 percent on my presentation of "Vanishing Act." The score wasn't perfect, but it was pretty good.

I really scored on the honey, though. Grandpa Ray dropped off some of the best honey I've ever tasted after he saw my presentation. I don't know where he got it, but that's a mystery I won't worry about solving just yet.



The Smart Swarm

Have you ever seen hundreds of ants moving in an orderly line along a sidewalk? How do so many ants find their way to a spill of soda? They have no sergeants, yet they march like trained soldiers, all focused on a single task. Scientists call this ability to work effectively in large groups *swarm intelligence*.

Think about a good sports team. When team members work well as a group, the team has more success than a team that does not work together. Certain animals also have more success when they work in groups. These animals rely on the work of the group to carry out a number of tasks, including finding food and avoiding predators.

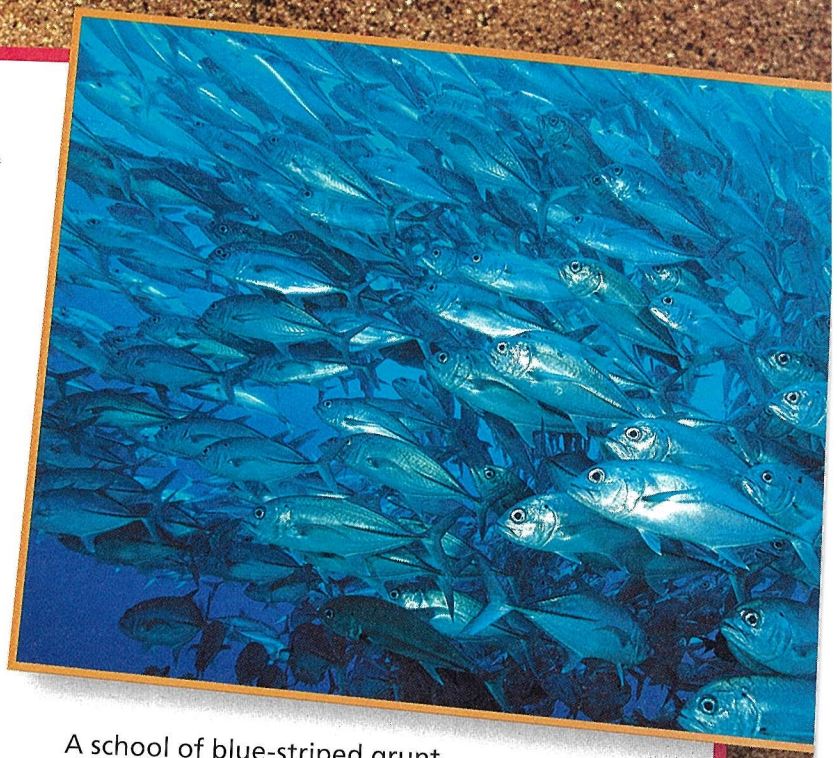
Weaver or tailor ants make an ant bridge to get to their feeding grounds.

Trail Building

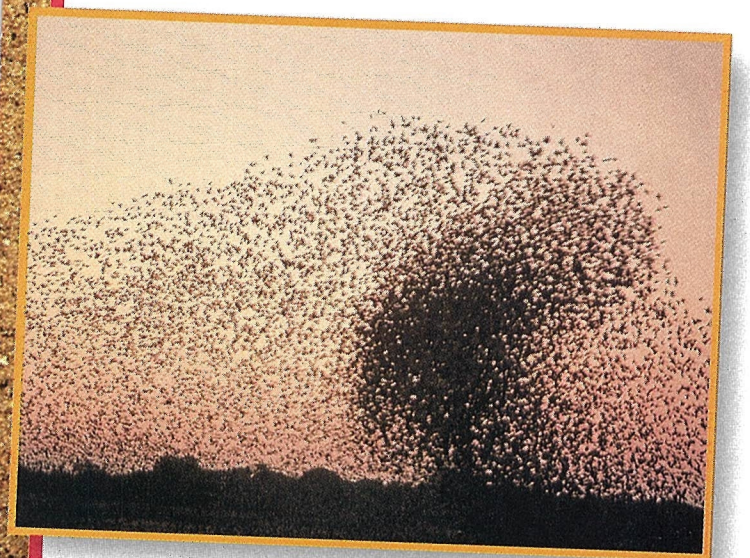
When an ant goes to forage, or find food, it leaves a faint trail of a chemical called a *pheromone* along its path. The pheromone has a scent or taste that other ants recognize. When other ants follow the path, they also leave a scented trail. Then the path most traveled becomes the path that is paved with the most pheromone. It is the trail that is easiest to follow and it tends to be the best route to the best food, thanks to the work of the group.

Evasive Moves

When a flock of birds or a school of fish darts away from a predator, it is using the skills of the group to keep it safe. If an individual separates from the group, it would be easy prey. But if the group sticks together, the predator has difficulty focusing on an individual to attack. Swarm intelligence works when one member sees a predator and changes direction. Others in the group immediately react and move together to avoid the predator. The action of the group keeps the animals safe.



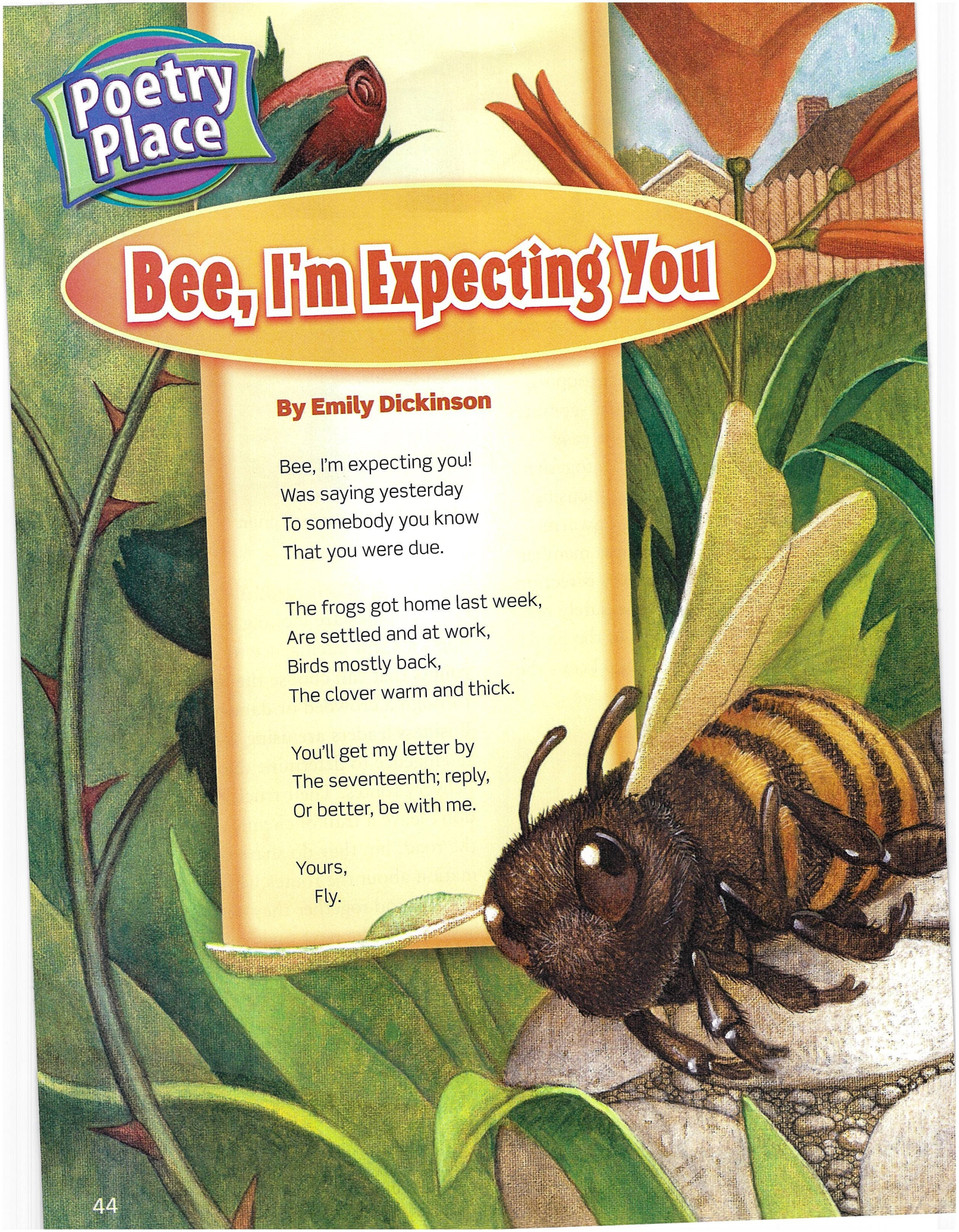
A school of blue-striped grunt



Flocks of the red-billed quelea, an African bird, often number in the hundreds of thousands.

Learning from Animals

Scientists are looking at ways to apply swarm intelligence to fleets of robots that can choose the best route through a crowded or dangerous area. Business leaders are using swarm intelligence to determine the best delivery routes. Their truck drivers don't leave a trail of chemicals along the road, but they do share the information about the routes with other drivers, and together they choose the best route. The next time you find yourself in a moving crowd, watch how the group chooses the best route. You might find that people are a bit more like ants than you realized.



Bee, I'm Expecting You

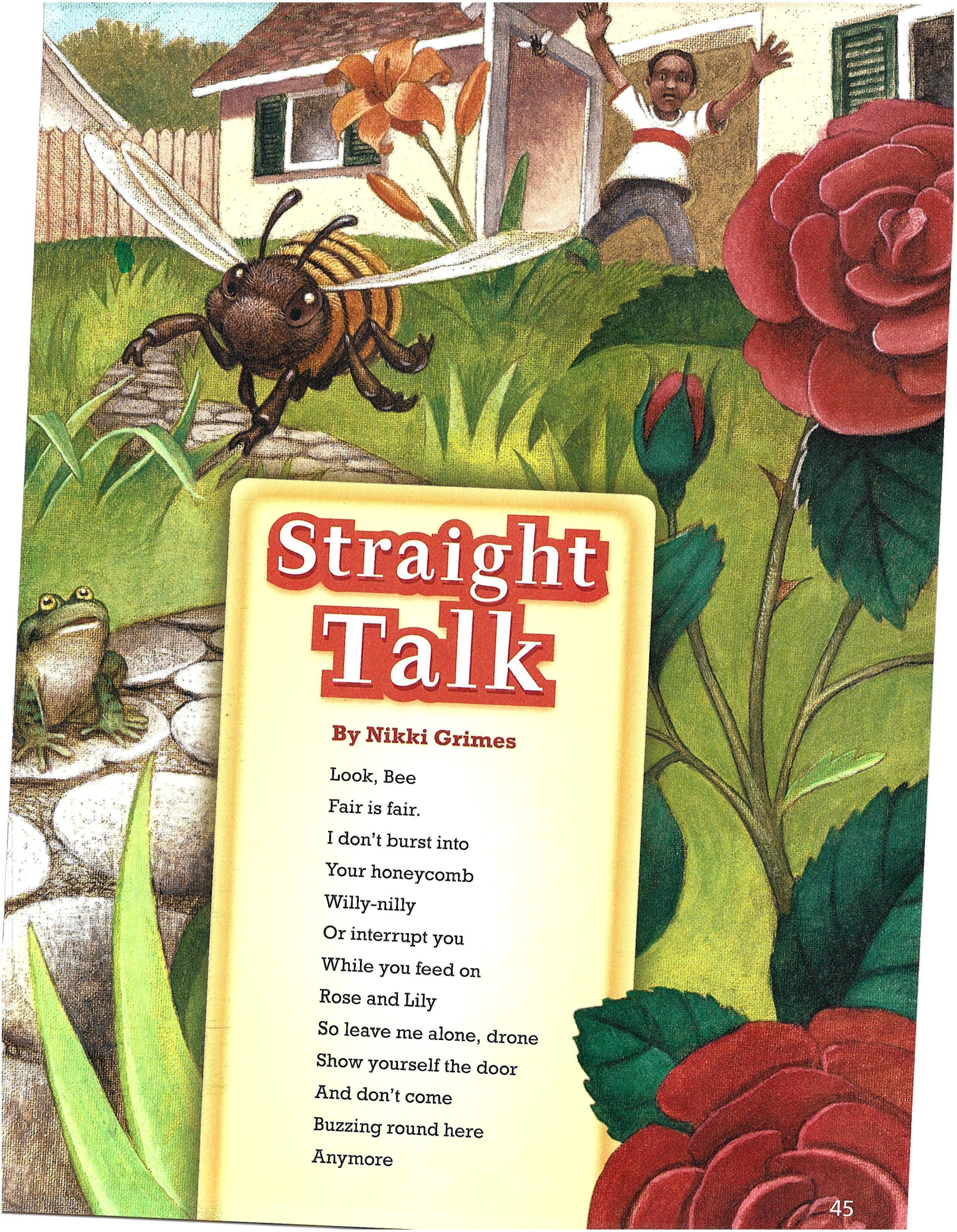
By Emily Dickinson

Bee, I'm expecting you!
Was saying yesterday
To somebody you know
That you were due.

The frogs got home last week,
Are settled and at work,
Birds mostly back,
The clover warm and thick.

You'll get my letter by
The seventeenth; reply,
Or better, be with me.

Yours,
Fly.



Straight Talk

By Nikki Grimes

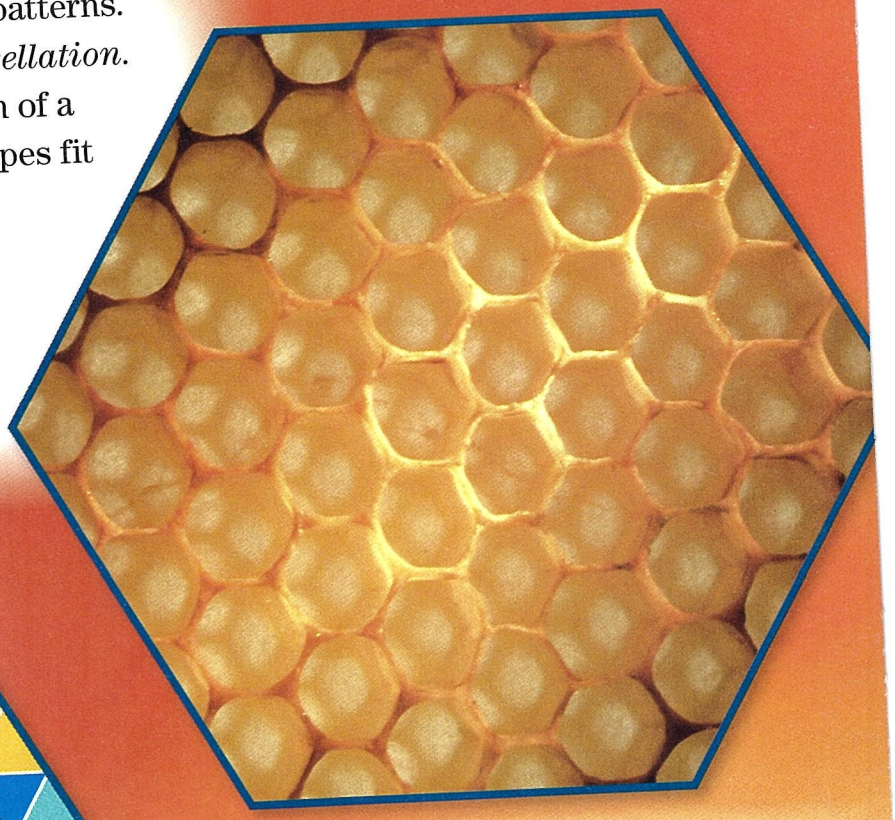
Look, Bee
Fair is fair.
I don't burst into
Your honeycomb
Willy-nilly
Or interrupt you
While you feed on
Rose and Lily
So leave me alone, drone
Show yourself the door
And don't come
Buzzing round here
Anymore

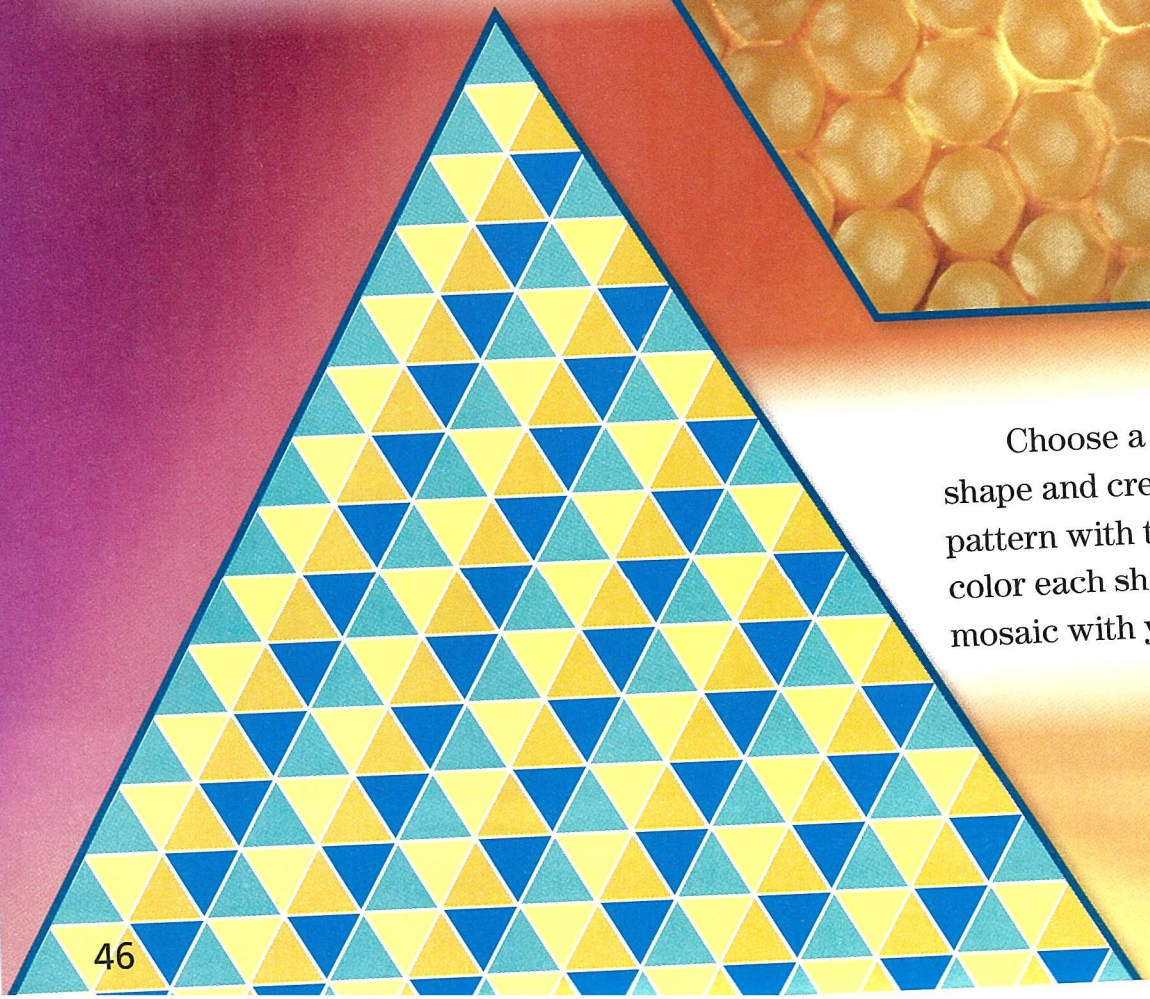
Activity Central

The Shape of Nature

The natural world is filled with patterns. One of these patterns is called a *tessellation*. A tessellation is the repeated pattern of a shape. The sides of the repeated shapes fit together like tiles on a floor.

We can see tessellations in the honeycombs of bees. The repeated shape in the honeycomb is a hexagon, a six-sided figure.





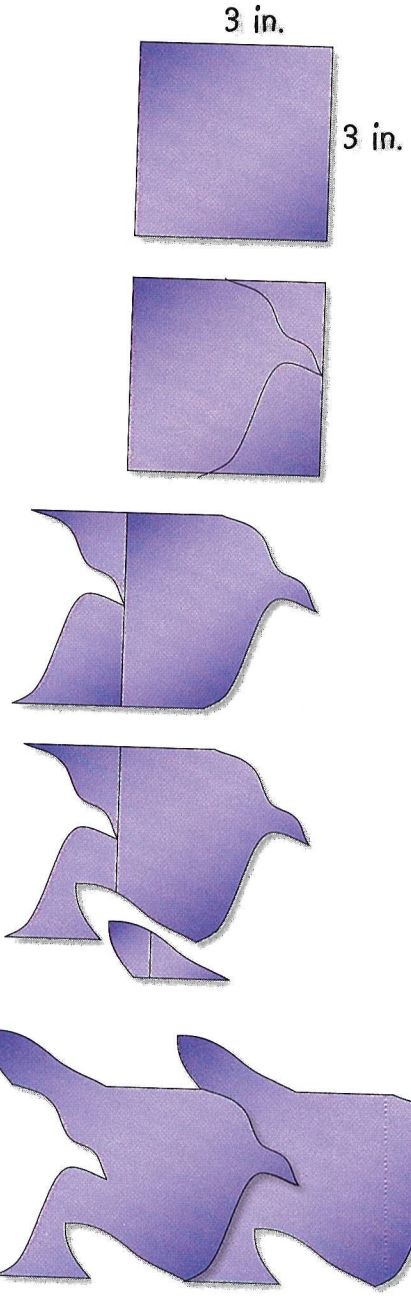
Choose a simple geometric shape and create a tessellation pattern with the shape. Then color each shape and create a mosaic with your tessellation.

Swarming Shapes

Tessellations can also be made with more complex figures. Artists have sometimes used complex tessellation patterns that resemble swarming birds, insects, or fish.

To create your own tessellation pattern of a swarming animal, follow these steps:

1. Cut out a 3-inch by 3-inch square of paper.
2. Draw a line inside the square on one side to represent the head of the animal.
3. Cut along this line, creating two new pieces of paper. Tape the straight edges of these back pieces to the straight edge of the front piece.
4. Draw a line inside the figure on the bottom of the animal to represent a wing or fin.
5. Cut along this line, creating another piece of paper. Tape the straight edge of this wing or fin to the straight edge of the top back piece. Your figure is complete and it should fit with another figure of the same shape.
6. Use this shape to trace a tessellation pattern on a large sheet of paper. Color the shapes similarly so that they resemble a swarm of birds, insects, or fish.

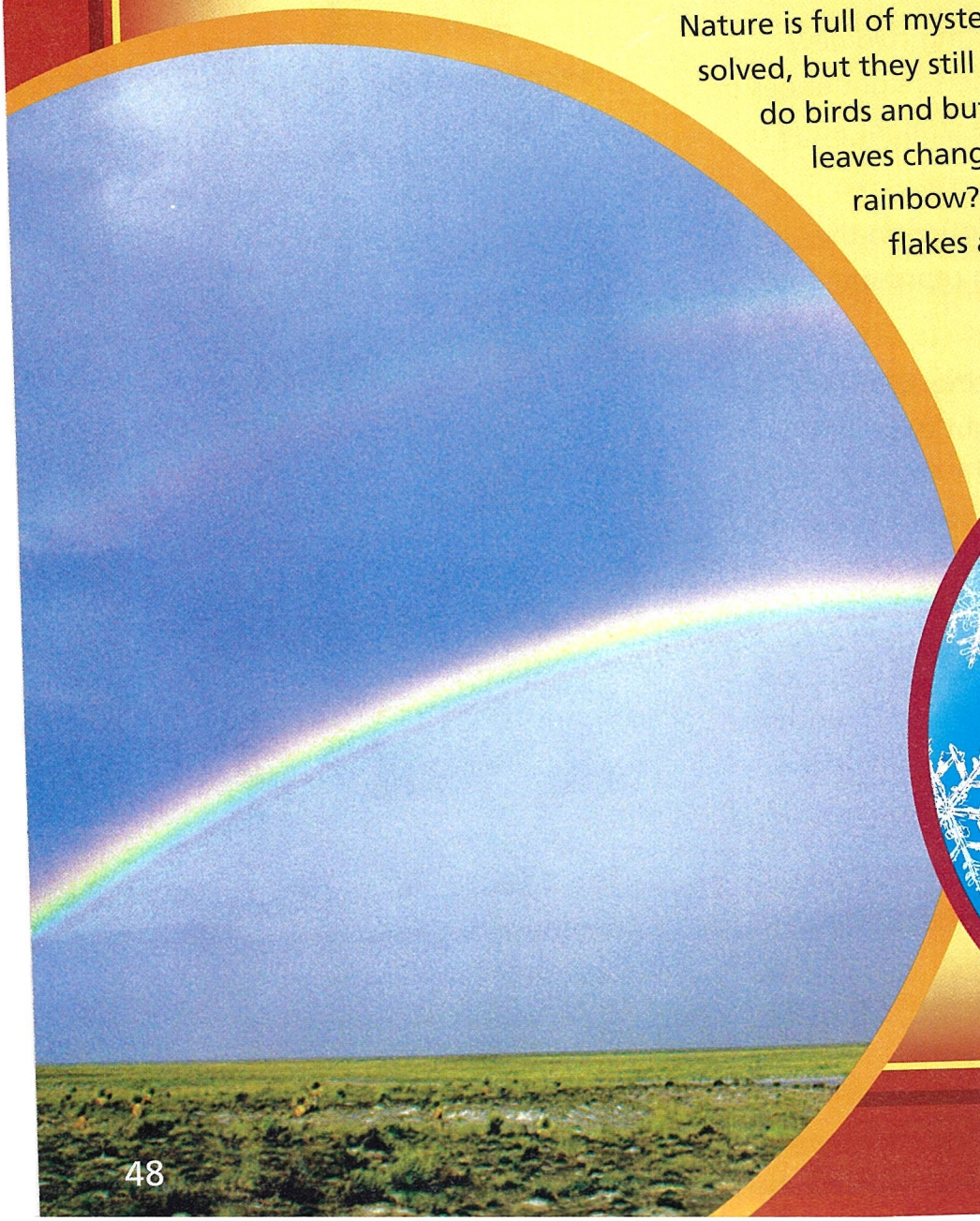


Your Turn

A Mystery

In "Vanishing Act," Tia tries to solve the mystery of the missing honeybees. She talks to people, gathers information, and considers reasons why the bees are missing. In the end, she doesn't find the bees, but she learns why they may have vanished.

Nature is full of mysteries. Many we have solved, but they still seem mysterious. Why do birds and butterflies migrate? Why do leaves change color? What causes a rainbow? Why are no two snowflakes alike?



# of Nature

Write a mystery story about something interesting in nature. Think about the weather, animals, plants, or rocks. Even if it's something you know the answer to, have a detective try to solve the mystery by gathering information the way Tia did. Make a story map. Here's an example to help you write your story.

Story Map

Characters: Jo (detective), Dan (friend), Sal (TV meteorologist)	**Setting:** Jo's town

Problem: Why do leaves change color in the fall?

Solution: Less sun causes trees to stop making chlorophyll.

Events:

1. Jo collects leaves for a project.
2. Dan tells her that Jack Frost makes them change color.
3. Jo calls Sal at the TV station.
4. He shows her leaf cells under a microscope.