

Beatriz

THE
BUILDER
BEE



By Robin Kropp

Illustrated by
Elena Makansi

Beatriz the Builder Bee
By Robin Kropp
Illustrated by Elena Makansi
A publication of the Arizona-Sonora Desert Museum
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The mission of the Arizona-Sonora Desert Museum is to inspire people to live in harmony with the natural world by fostering love, appreciation, and understanding of the Sonoran Desert.

We are grateful to the many people who helped this book come to *bee*. Buzz Hoffmann, Tom Christensen, Pam Rossetter, Cheryl Blake, and Glenn and Rae Seplak from the Desert Museum Bee Team provided countless thoughtful suggestions and fact-checking. Catherine Bartlett, Schreen Raboza Davis, Sarah Hitchings, Dorea Kleker, Kristy Makansi, Roxane Ramos, Katherine Henckler, and Jan Moss provided additional editorial insights.

The Flowing Wells 2023-24 second graders gave us great feedback about their vision for Bee School. Stephen Buchmann, Glenn Seplak, Buzz Hoffmann, Joseph Wilson, Peter Bryant, Liz Kemp, and Amanda Leighton generously contributed their photographs for the glossary. And, finally, many thanks to Debra Colodner, Ph.D, the Desert Museum's Director of Conservation Education and Science, and the Institute of Museum and Library Services who made this book, and the We Bee Scientists Curriculum of which is part, possible.

Where would we bee without you?

Discover the We Bee Scientists free science curriculum here:
desertmuseum.org/wbs

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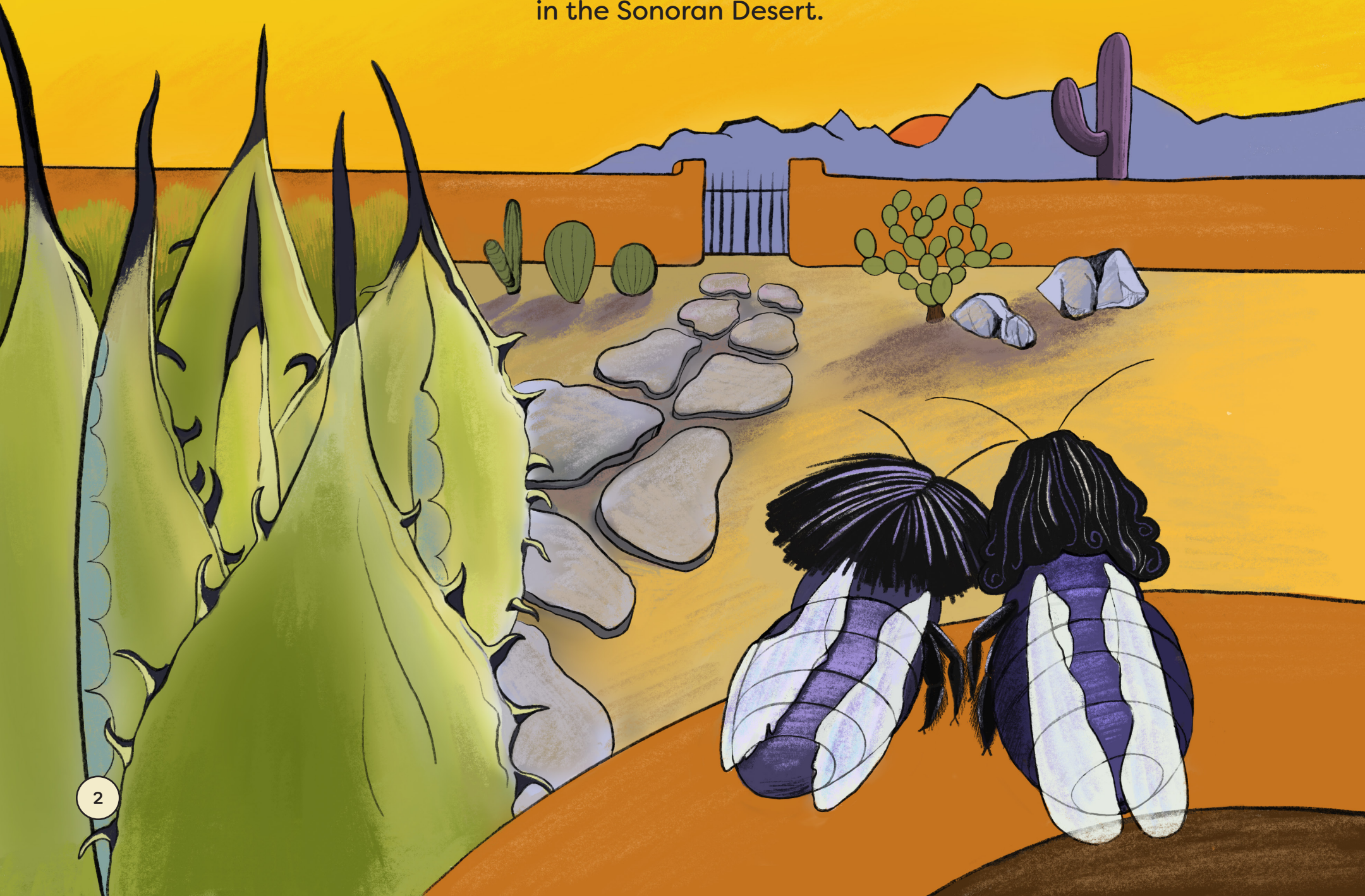


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Hi, I am Beatriz. I am a builder bee.
I come from a long line of carpenters.



I live with my mom
in the Sonoran Desert.

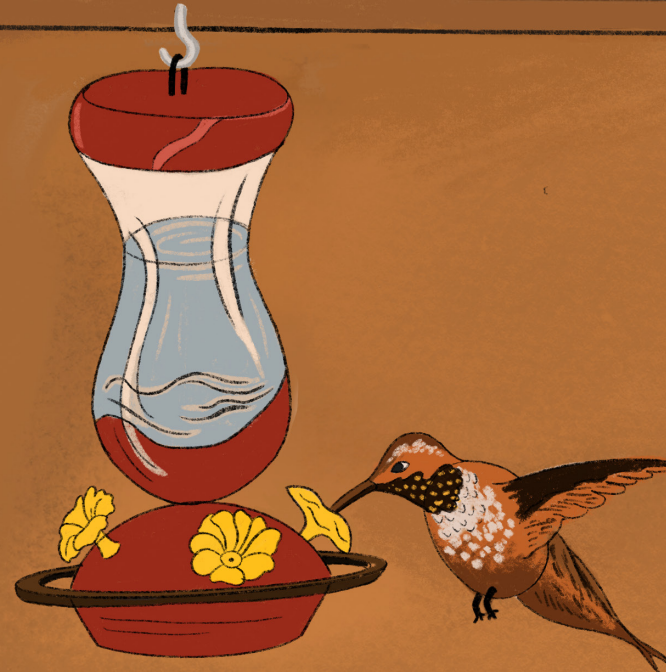


My mom is an award-winning architect, and I think her very best work is the cozy home she built for us.





Mom searched far and wide for the perfect place to build. When she found the large, wooden beam under a sheltering roof, she just knew it was home. She carved the doorway into the most protected spot to keep out the sun, rain, and wind, then hollowed out the rooms.



Besides building, Mom is a great pollinator. She visits our neighborhood flowers to collect nectar and pollen to make delicious bee bread. By spreading pollen from flower to flower, she helps them become fruits that all of our neighbors enjoy.

My dad pollinates, too, but Mom says that the perfume he makes is what really won her heart.



It's a good thing we bees have six legs because things are going to get a lot busier at home very soon. I am going to be a big sister! I can't wait! Mom is building an addition to our house for the nursery. Every day when I get home from bee school, I visit the new rooms and wonder what my siblings will be like.



My best friend, Gloria, is in my class. She lives next door with her mom. We fly to school together every day.





I love bee school! I want to be an architect like my mom. My teacher helps me build my skills. She shows me how to carve rooms with my mandibles and construct sawdust walls. We start with the soft wood of old tree branches, but next year I will advance to beams.

CARPENTRY
BASICS



pollinator garden

RULES

Bee kind
Bee Respectful
Bee Honest

BEE SCHOOL

YOU
CAN
DIG!
IT!

We have lots of friends in our class. Gloria is a digger bee, so she joins the digging group along with...

Samantha, the
sweat bee...

and Felicia,
the fairy bee.

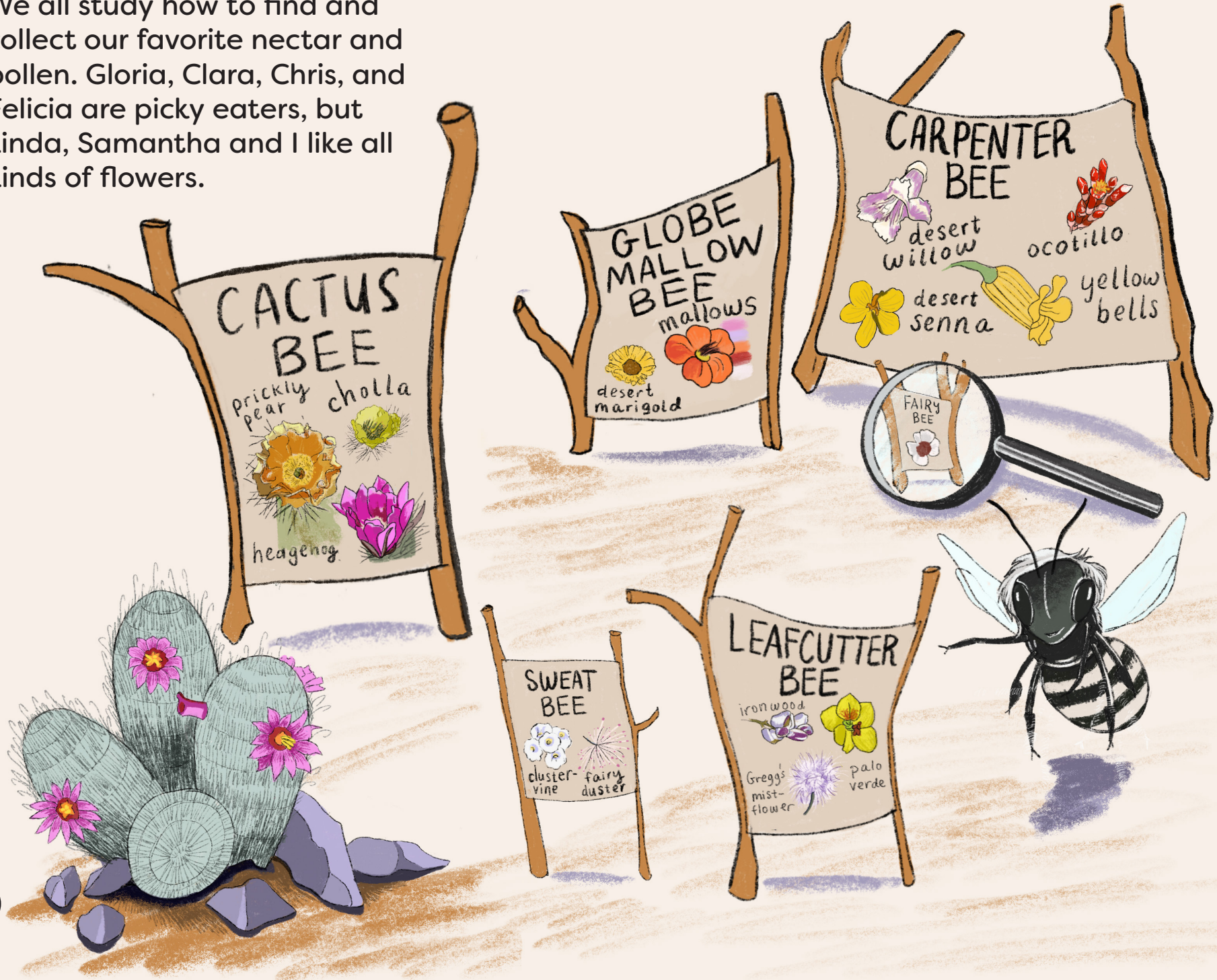
Clara and Chris, the
cactus bees...

They all study which soil is best for ground nests, taking care not to accidentally bury tiny Felicia as they dig. Gloria and Clara practice how to construct turrets with their own special flair.

Linda is a leafcutter bee. She learns to cut half circles of leaves to line her nest holes like tiny sleeping bags.



We all study how to find and collect our favorite nectar and pollen. Gloria, Clara, Chris, and Felicia are picky eaters, but Linda, Samantha and I like all kinds of flowers.



Bee school is full of human children too. Sometimes they come to their school garden to pick vegetables.

The other day I think I scared them among the tomato flowers. They jumped when they saw me!

“Oh, wow, a carpenter bee! They help our tomato plants make fruit. They won’t hurt you.”

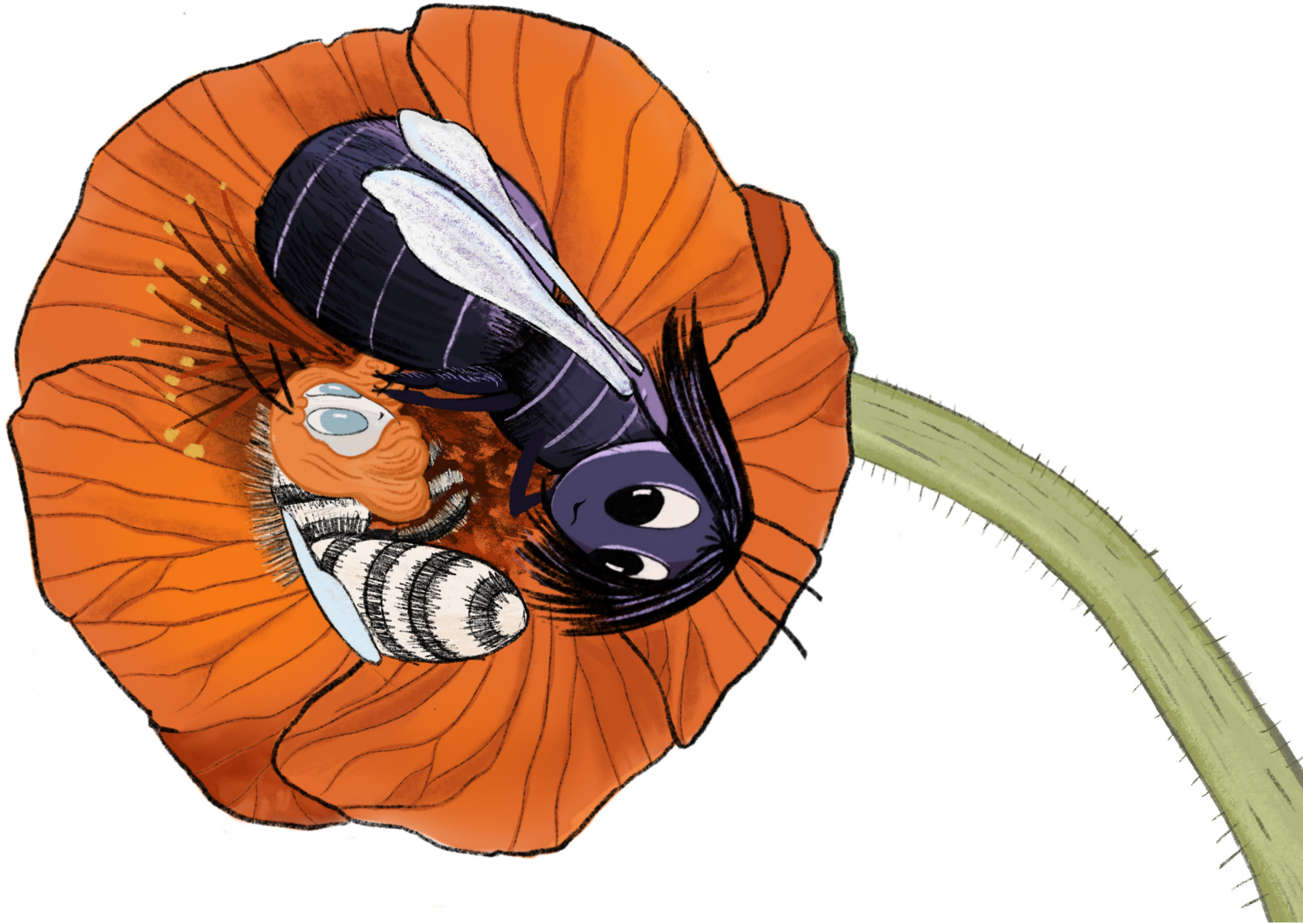


But their teacher came over and reassured them that I was safe.

Now when we see each other, the children are excited, not scared.



After school, Gloria and I spend almost every afternoon together. Gloria is a globe mallow bee, and her mom dug their house near their favorite plants. Sometimes Gloria and I take a nap in the pretty orange flowers that hold us like a hammock. Then we have a nectar snack and play.






Today, I want to show Gloria the nursery, so we fly to my house. Mom is beaming and announces that it is ready for her to lay her eggs!

She asks if we would like to help make bee bread for the baby bees. We excitedly collect pollen and nectar, just like we practice at school, and she shows us how to form the loaves.

Mom carefully carries a loaf of bee bread into the nursery. She lays an egg on it, then builds a sawdust wall to create a tiny bedroom. She invites me to make the walls for the rest of the brood, and Gloria brings bee bread for each one. It is hard! Mom is so much faster, and her walls are even and smooth. I do my best, and it gets easier.

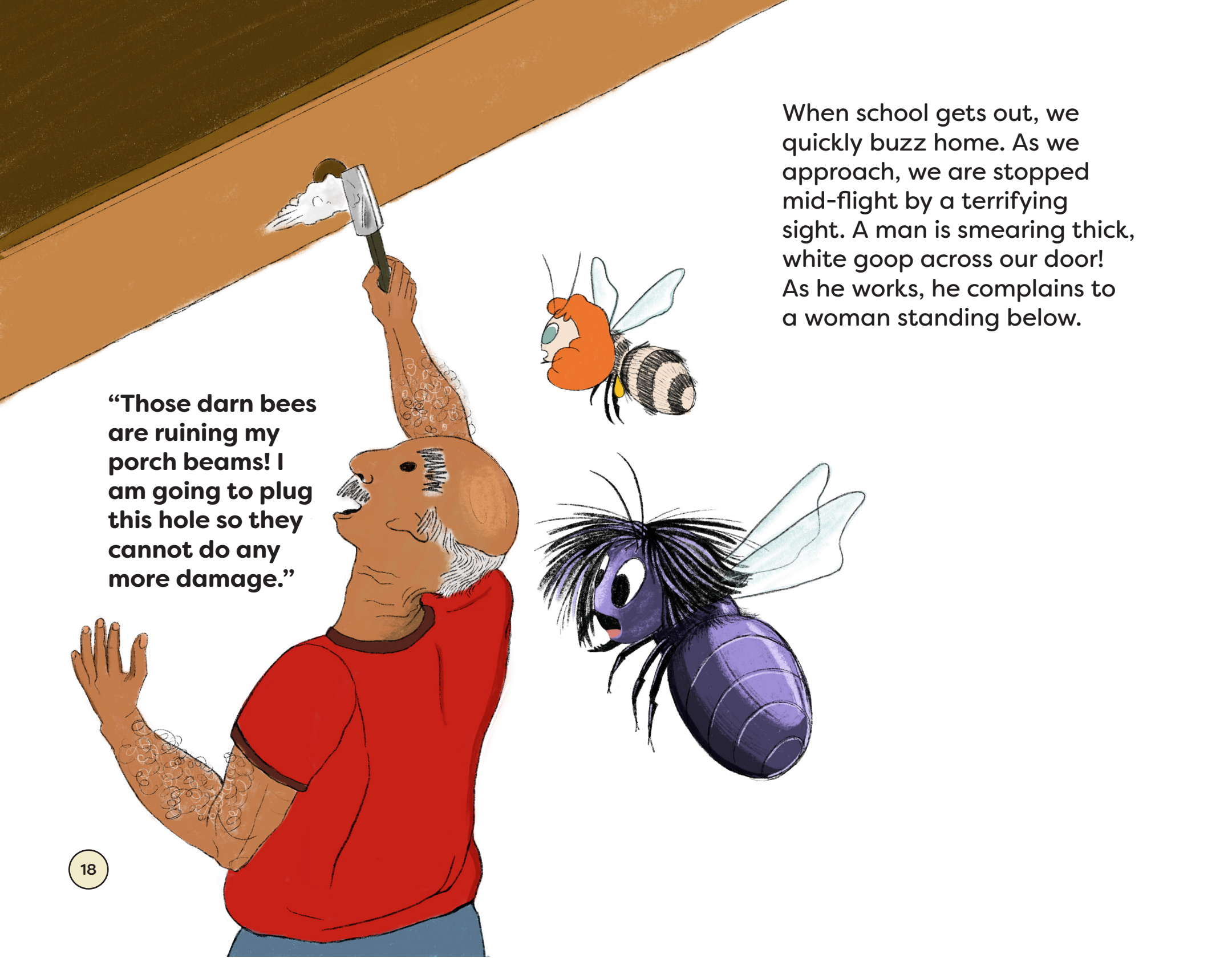
While we work, Mom explains that the walls keep each larva safe and comfortable. They will hatch, eat their bee bread, and grow. After a few weeks, they will be big enough to chew their way out and join us!



A colorful illustration featuring a large purple fly with translucent wings and a small, cheerful orange bee with curly hair. They are flying together in a field of bright yellow daisy-like flowers with brown centers and green stems. The background is a light blue sky.

Every day after school,
Gloria and I fly directly to
the nursery door to look for
a freshly-chewed hole.

Today I am eager
with anticipation.
I feel in my thorax
that this is the day!



“Those darn bees are ruining my porch beams! I am going to plug this hole so they cannot do any more damage.”

When school gets out, we quickly buzz home. As we approach, we are stopped mid-flight by a terrifying sight. A man is smearing thick, white goop across our door! As he works, he complains to a woman standing below.

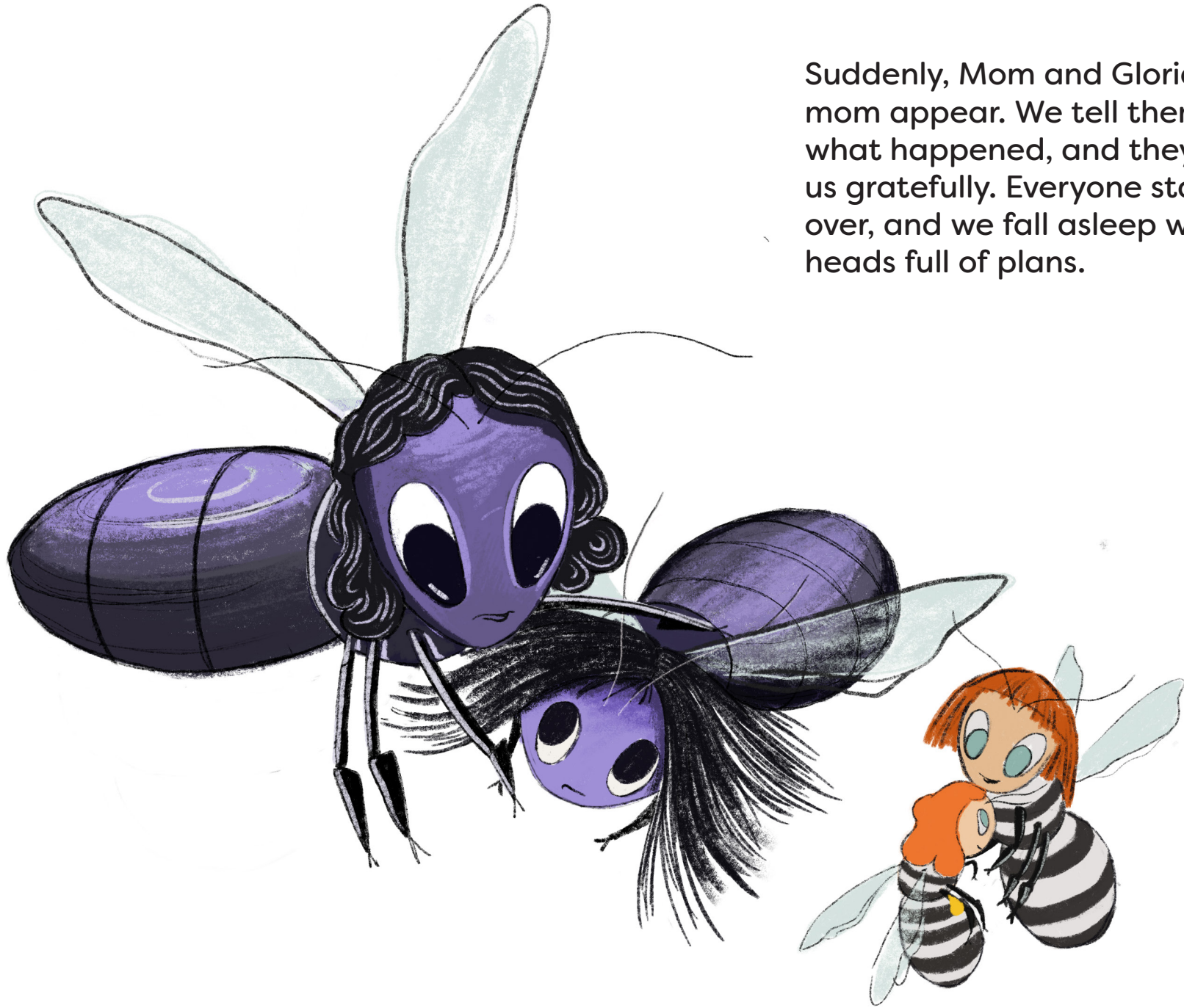
Gloria and I wait till they leave, then approach the door. The goop is hardening fast. We have to do something! We quickly get to work. I chew and Gloria digs, and a small hole forms. We make it wider, and soon we see a tiny bee head. It is one of my siblings.

“Keep chewing!” I encourage them.

They chew the hole until it is wide enough for their body, then, one after the other, all of my sisters and brothers climb out.



Suddenly, Mom and Gloria's mom appear. We tell them what happened, and they hug us gratefully. Everyone stays over, and we fall asleep with our heads full of plans.





In the morning, a clanking sound wakes us. The man is back with his ladder. He wobbles beneath our door with a spray can in his hand.

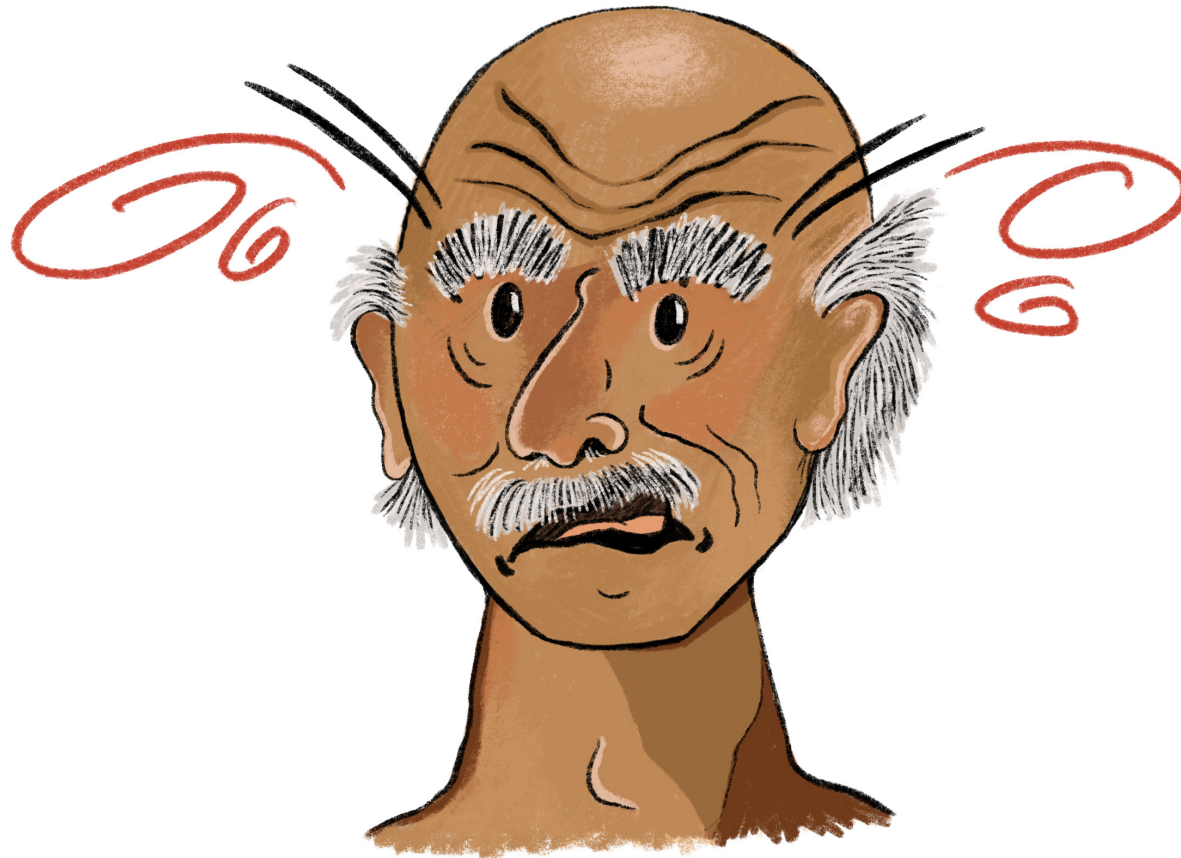
He calls into the house, **“Can you come hold the ladder?”**

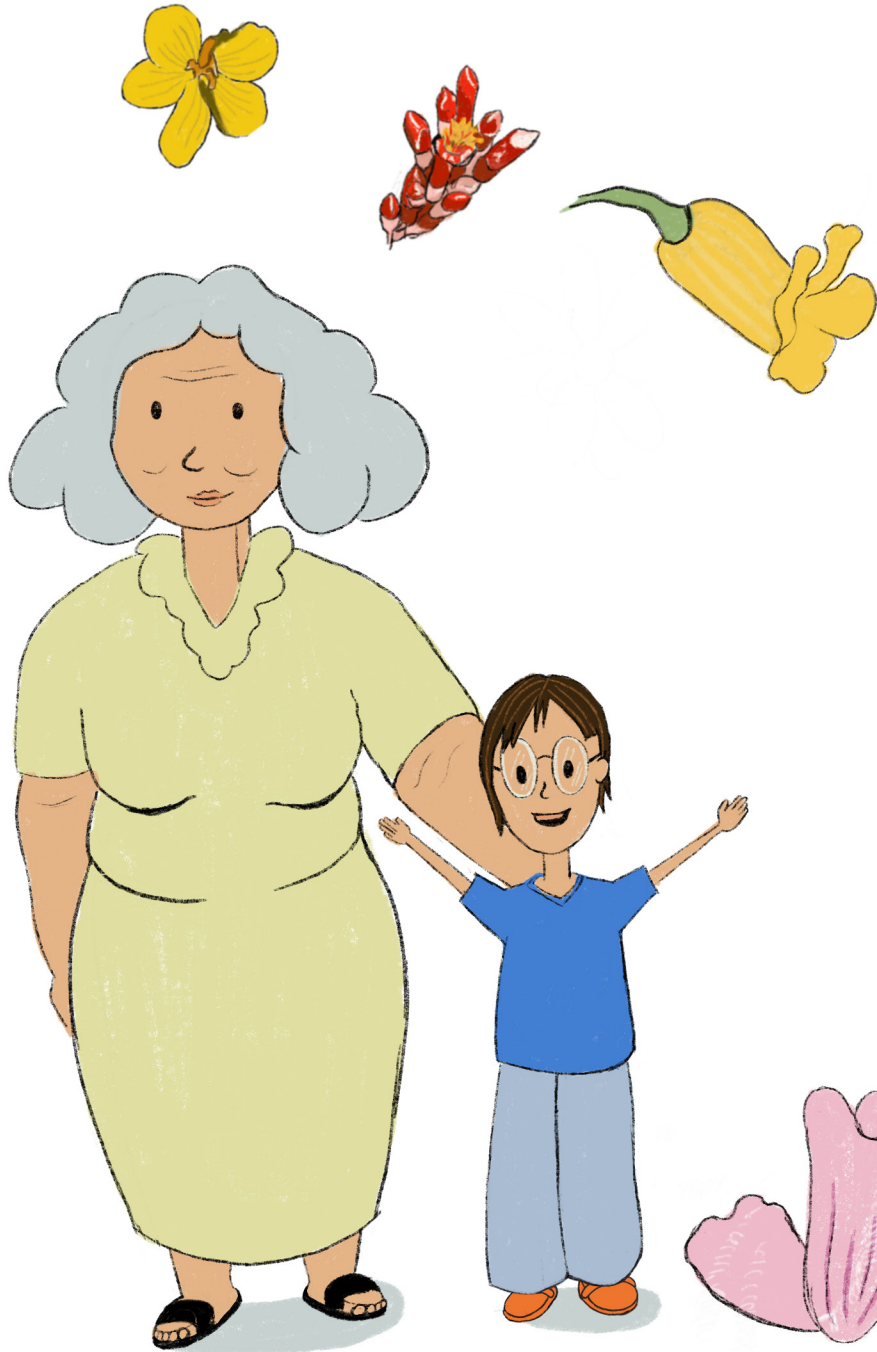
The woman comes out. This time, a child is close behind. It is my neighbor I saw at bee school!

They ask, **“What are you doing, Grandpa?”**

“Those darn bees are back in their hole again. We need to spray them to put a stop to this!”

But the woman shakes her head and says, **“No, I don’t want us to use those chemicals. If they kill bees, they can’t be good for us or the birds or the ground squirrels either.”**





The child says, **“That is a carpenter bee house, Grandpa. We learned about them in school.”**

Grandpa looks doubtful, but the child adds, **“We need the bees—they pollinate flowers! And they need a place to live!”**

Grandma agrees, **“You sure love your garden. One little hole in our beams seems like a fair trade for all the tomatoes and chili peppers they give us each summer.”**



We all hold our breath.

Grandpa looks at the garden for a long moment then lowers his spray can and says, **“You’ve both got a point.”**

He steps down and sets the ladder aside.

“Maybe we can harvest some right now. Do you want to help? We can make salsa!”



The child runs for a basket, and they enter the garden. Our home is safe! We follow to feast on flowers and show my siblings their desert home. It's going to be a good day!



Welcome to the Bee Capital of North America!

The Sonoran Desert region has some of the greatest diversity of bees anywhere, with likely more than 1,000 different species. These native bees have been here far longer than the European honeybees who arrived in the 1600's. Most live alone, and the females are hard-working solitary moms who create nest chambers in the ground, wood, or other crevices, then collect nectar and pollen to feed their brood. Though they can sting, they rarely do unless threatened. Males are stingless.

As they forage for food, bees spread pollen from one flower to another and help plants reproduce. The resulting fruits, seeds, and nuts feed all kinds of animals, including people. The plants they pollinate also give us fibers, building materials, and medicines. Ground-nesting bees are also good for the soil. Their tunnels allow air and water to get to plant roots, and their poop makes good fertilizer. Finally, bees are food for many different predators including amphibians, reptiles, birds, mammals, spiders, and other insects.

Bees help us, but they need our help, too! As people clear land for buildings, farms, and roads, bees lose food plants and nest sites.



The Tucson Bee Collaborative is a group of scientists and educators from around Southern Arizona who are working to better understand and spread the word about our amazing native bees. For more information, check out their website at tucsonbeecollaborative.org.

You can also find multiple native bee resources in the teacher background information in the Grade 2 We Bee Scientists Curriculum at desertmuseum.org/wbs.

Scan me!



Scan with your phone to learn how to make a bee house!



We can help our native bees! How? We can:

- ⚙️ Plant native plants of many varieties in clumps and clusters to provide bees' favorite food.
- ⚙️ Leave out dead branches, stumps, and flower stalks or build bee houses for wood nesters to use.
- ⚙️ Keep some soil bare and free of gravel, mulch, or pavement for ground nesters.
- ⚙️ Provide a source of water—most native bees get the water they need from nectar, but some use it to make mud for their homes.
- ⚙️ Avoid using pesticides that can harm bees.

Glossary

Diversity: Many different kinds or varieties of something.

Native: Animals and plants that are naturally found in an area.

Nectar: Sweet liquid that flowers make to provide energy and water for pollinators.

Pollen: Powdery substance in flowers that helps them make fruits and seeds. Bees and other pollinators eat it to build muscle and grow strong.

Bee Bread: A ball of pollen and nectar that is food for each bee larva.

Brood: A nestful of young animals, such as bees or birds, which are not yet grown up.

Larva: A young bee that passes through growth stages before becoming an adult bee.

Mandibles: Mouth parts a bee uses to cut or grab leaves, carve nests in wood, dig in the ground, or defend themselves.

Antennae: Body parts on the head of many insects used for tasting, smelling, or communicating.

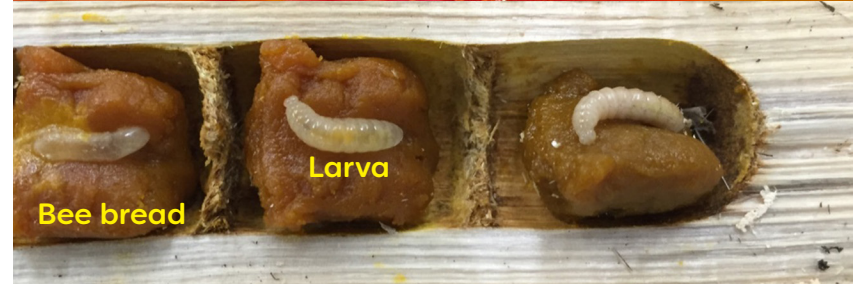
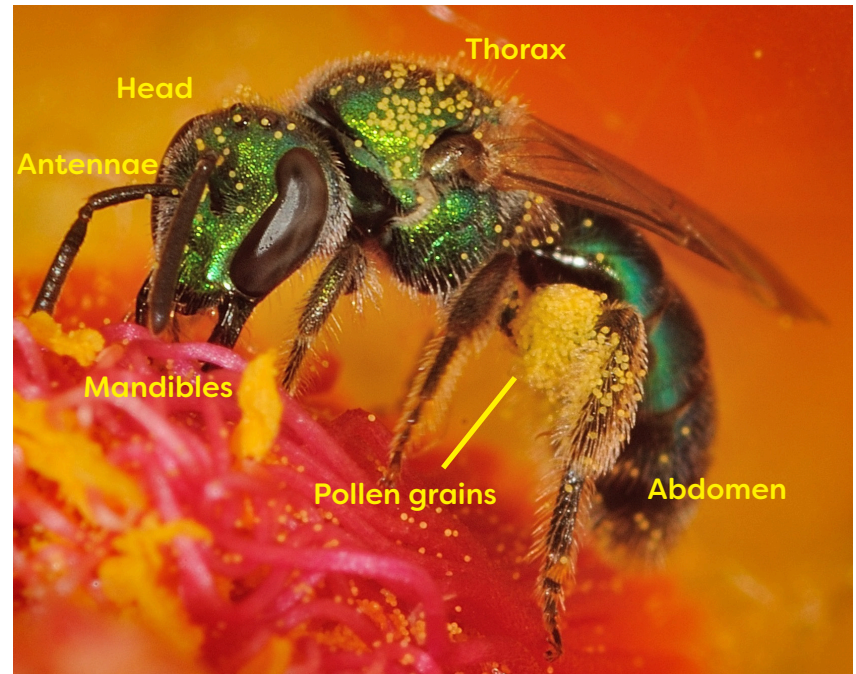
Thorax: The part of an insect's body between the head and abdomen that contains wing muscles and to which the legs and wings are attached.

Abdomen: The third main body part of an insect, found at the tail end, that contains organs for digestion and reproduction.

Turret: A chimney of soil that many ground-nesting bees make to protect their nest holes.

Fun Facts about the Featured Bees

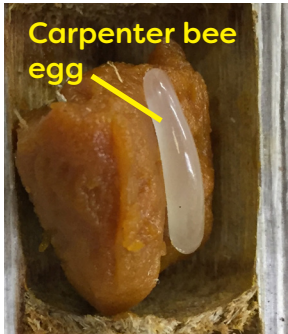
With this book, we highlight the diversity of the Sonoran Desert region's native bees. We featured the largest (the carpenter bee), the smallest (the fairy bee), and some of the cool characters in between. In reality, most native bees keep to themselves and don't spend time together like Beatriz and her friends do. Here are some fun facts about them!



Valley Carpenter Bee (Beatriz, page 1)

Xylocopa sonora

At almost an inch (25 millimeters) long, these gentle giants are the largest bees in our region. Females are shiny black, and males are fuzzy and golden brown, giving them the nickname “teddy bear bees.” Females chew nest tunnels into dead trees, fence posts, or structural beams. They visit many kinds of flowers to collect nectar and pollen and form it into bee bread for their brood. They place a ball of bee bread in the tunnel and lay an egg on it—their are the largest eggs of any insect—then build a sawdust wall to protect the larva in its own brood cell. They repeat these steps for 15-20 cells.



Carpenter bee egg



Mother carpenter bee feeds her young daughter at the nest hole



Butterfly sips nectar from flower cut by a carpenter bee



Female carpenter bee



Male carpenter bee

Each larva takes about fifty days to grow through the life stages of egg, larva, pupa, and young adult. Males grow more quickly and emerge first, followed by females. Daughters from the previous brood will help to care for and feed the youngsters. Females can live up to three years, while males live less than a year.

They leave the nest to find mates in the spring. They have special glands to make attractive perfumes so females can find and choose them. Males don't help to raise young but do visit flowers for food, and thereby pollinate the plants.

Carpenter bees can perform buzz pollination—they use their wing muscles to vibrate their bodies and shake pollen from flowers such as tomatoes and native senna. (Blueberries and potatoes also need buzz pollinators to make fruit and seeds.)

Carpenter bees can also be nectar robbers. They use their strong mandibles to cut holes at the base of tube-shaped yellow bell (*Tecoma stans*) flowers to steal the nectar without pollinating them. These holes benefit other insects and even small birds who easily reach the nectar meal.

Close-up of male carpenter bee face



Globe Mallow Bee *Diadasia diminuta* (Gloria, page 7) and Cactus Bee *Diadasia rinconis* (Clara and Chris, page 10)



Globe mallow bee



Cactus bee turrets

A fairy bee next to a dime
Photo: Joseph Wilson



These small to medium-sized bees are close relatives. They are picky eaters who prefer to feed on their namesake flowers. Females of both species dig nest tunnels into the ground. They are sometimes called “chimney bees” because they build turrets at their nest entrances. These could keep soil, rain, or predators from entering the holes, or they could help each female locate her nest among many. People have watched some *Diadasia* disassemble their turrets after egg-laying, perhaps to plug the brood cells’ entrance tunnel.

In the story, Gloria and Beatriz like to nap in the globe mallow flowers, but in real life, females rest in their nest tunnels, while males sleep in flowers. And Gloria would not live with her mother in her nest. Unlike the long-lived carpenter bees, most ground-nesting bees only live for one breeding season. Their young overwinter as prepupae, pupate in spring, and emerge to start the cycle anew.

Fairy Bee *Perdita minima* (Felicia, page 10)

These tiny bees (just 2 mm long) also nest in the ground and are picky eaters who need very tiny flowers. They are too small to sting humans.



The orange pen shows the size of the white flowers that fairy bees prefer



Cactus bee

Leafcutter Bee (Linda, page 11) *Megachile polycaris*



These medium-sized bees visit many kinds of flowers, especially in the bean and sunflower families. Unlike most other bees who carry pollen in special hairs on their legs, leafcutter bees have special pollen-carrying hairs on their abdomens. If you see a dark bee with a bright yellow belly, it is probably a leafcutter.

They nest in pre-existing holes in wood. Many *Megachile* bees use their mandibles to cut tiny half-circles of leaves to line their nest cells. They will also nest in soil, plant stems, twigs, rotting wood, or human-made structures like roof shingles. They use a variety of materials to seal their brood cells, including sand, plant sap, mud, pebbles, wood chips, or chewed leaves.



Sweat Bee (Samantha, page 10) *Augochlorella pomoniella*

These small, shiny metallic green bees visit many different flowers and nest in the ground. They are called sweat bees because they sometimes land on people and drink their sweat! Some sweat bee females raise up to three broods in a season, with daughters helping to collect pollen and nectar for the next generation. Females from the final brood overwinter and start the next year's broods.



The Sonoran Desert Region



Acknowledgements

We also wish to thank the following busy bees for their contributions to We Bee Scientists curriculum. For their leadership and teaching expertise to develop the curriculum: Andrea Aamodt, Derek Brown, Anna Heyer, Tyler Kiecolt, Jennifer Stretton, Danielle Van Derlaske, and Jessica Wendt.

For design, website development, videography, and photography: Nancy Serensky, Kayla Velasquez, Liz Kemp, Michelle Miner, Jesús García, Glenn Seplak, Stephen Buchmann, Joseph Wilson, Tom Christensen, Jay Pierstorff, Bruce Taubert, Kim Franklin, Elena Makansi, Frank Armendarez, Carole D'Angeli, CK Kelly, Jack Goldfarb, and Sarah Lee Allen.

For their knowledge and feedback: Tucson Bee Collaborative's Jennifer Katcher, Wendy Moore, Tanner Bland, Chip Mercurio, and Bob Elder.

For all the loose ends and general support—the rest of the Conservation, Education, and Science team of the Desert Museum: Samantha Bellerson, Gloria Castillo, Anna Domitrovic, Danielle Gastellum, Perry Grissom, Ya-Ching Lin, Angela Loya-Stoebe, Sonya Norman, Nicholas Powers, Katie Predick, Erin Riordan, Kyleigh Sacco, Penny Savoie, Kaitlyn Tyler, and Alec Young.





We Bee Scientists

The Arizona-Sonora Desert Museum and Flowing Wells Unified School District co-designed these place-based STEM units for elementary grades. The K-5th grade units incorporate local phenomena, research from Museum scientists, and biodiversity data to enhance student engagement and support teachers teaching science.

About the Author, Robin Kropp

Robin has been a teacher at the Arizona-Sonora Desert Museum since 1998. She loves to tell the stories of the tiny heroes that are all around us doing their important work and to help people appreciate them.

When the We Bee Scientists curriculum team chose carpenter bees as their mascot, she went online to do research. The top posts were from extermination companies that told people to fear carpenter bee damage to their homes and how to eliminate them. Robin believes we need to share a different story, one where humans and bees can live side by side. This is that tale.

About the Illustrator, Elena Makansi

Elena Makansi is a children's book illustrator and mixed-media artist. She fell in love with the ecology of Sonoran Desert and decided to set down roots in Tucson and share about the wonders of our unique ecosystem through storytelling and art.



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