

Why Does My Shadow Follow Me?

More Science Questions from Real Kids



Written by Kira Vermond

Illustrated by Suharu Ogawa

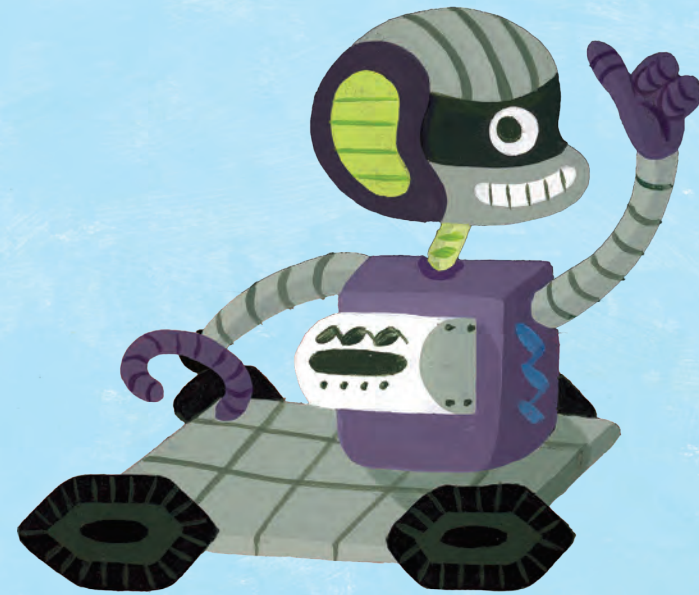
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For Amy B., my rock.
—KV

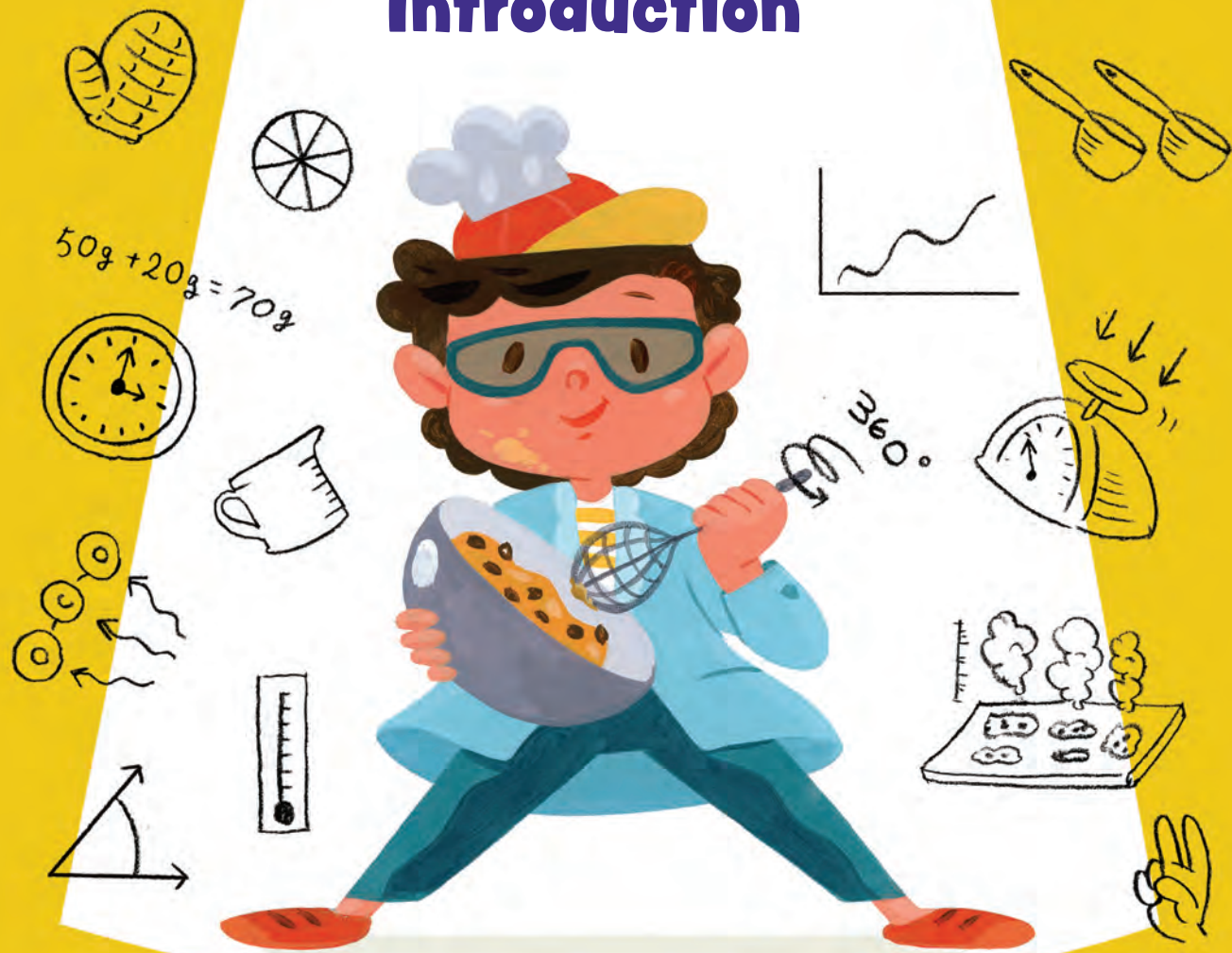
For Nonoka, Kyusuke, Anne, Ai, Aki, Shisei, Avital, Lior, and Matan.
—SO



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Introduction



Congratulations! You're already on your way to becoming a scientist. Yes, that's right. You!

Every time you . . . bake a batch of cookies, squish mud between your fingers, ride your bike down a hill (yippee!), dunk a basketball through a hoop, or rub a balloon on your hair and watch it stick to the wall . . . you're running experiments to help yourself explore and understand the universe around you. "Experiment" is really just another word for play.

And kids are experts at playing!

Real Kids, Real Questions

Every question in this book came from kids who visited the Ontario Science Centre in Toronto, Canada—at a makerspace café called The Maker Bean, a place where café and technology meet. Here, their amazing and intriguing questions were laser-cut into personalized wooden coasters to use at the café and start science conversations with other visitors.

Educators and science researchers who work at the Centre came up with the answers for this book. But that's just the beginning! Hopefully this book will spark some new ideas and get you to ask yourself one very big question: What are you wondering about these days?

Science might have a fancy name or seem complicated, but it really all starts with the process of testing out ideas—again and again—to answer questions.

Take cookie baking. To develop a yummy cookie recipe from scratch, you start with a question. ("What would happen if I added chocolate chips to cookie dough?") If you predict that it will taste good, that's called your "hypothesis." But . . . don't just dive right in! Before mixing and measuring, you'll want to check out other cookie recipes. That way, you'll learn what ingredients work (butter!) or don't (celery!) based on previous bakers' trial-and-error lessons.

Now the fun part! You have to bake many batches, tweaking and testing ingredients as you go to get the best buttery, chocolaty crunch. Then you have to repeat the process—or experiment—numerous times to confirm your results. Tough job, but somebody's got to do it!



Some adults experiment for a living. They actually get paid to play. They're called scientists, and their work touches almost everything around you, from the video games you play to that pizza on your plate. Some of them create medication to save lives or find new ways to heat homes without damaging our beautiful planet. But they don't work alone. Far from it. Scientists all around the world share their questions and answers with each other so everyone can learn together more quickly. And that's where things get really interesting.

Science is sewn into the very fabric of who we are as humans. And all scientific discoveries start with questions just like the ones you'll find in this book. Turn the page and maybe you'll be inspired to ask, test, and repeat, too!

Explore More

Want to get more out of this book? Keep an eye out for cool facts, insights into scientific breakthroughs—and even experiments for you to try! Look for titles, "Ask About . . .," "Play and Learn," and "Share This!"



CHAPTER 1

I've got questions about...

Cute Critters and Up-ROAR-ious Creatures

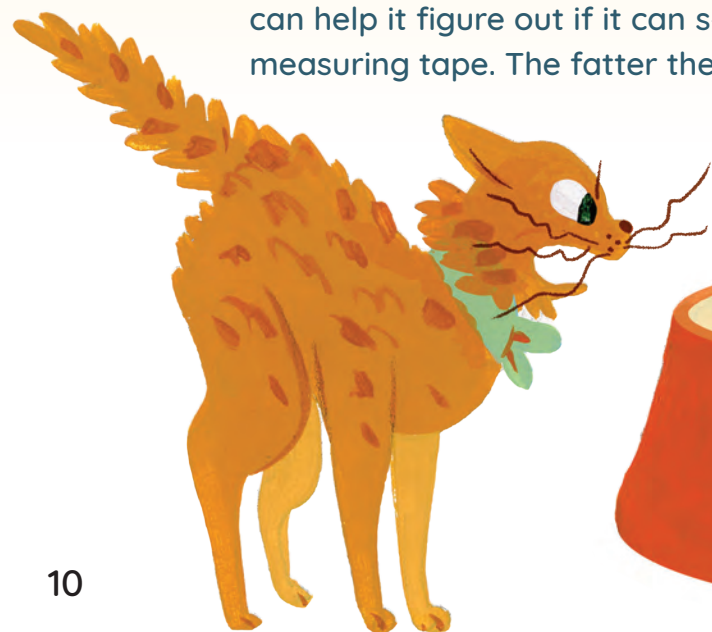
From butterflies that taste with their feet to sea lions that can keep a musical beat, we share the planet with billions of amazing living things. And let's not forget the ancient creatures that roamed and roared millions of years ago. Here's some wild stuff about Earth's most intriguing beings that slink, swim, and soar.



What do cats use their whiskers for?

Those long, stiff hairs on cats' faces aren't just for tickling you. Whiskers—also called “vibrissae”—are highly sensitive tools that help cats navigate the world. You'll find them above the mouth and also above a cat's eyes, and on its ears, its jaw, and the front of its legs! Whiskers even tell you a bit about a kitty's mood. When a cat is relaxed, its muscles relax, too, so the whiskers hang loosely. But when a cat is scared, the muscles pull the whiskers tight against its face.

Whiskers attach to nerve endings deep inside the skin that feed information to the brain. Even a tiny change to a cat's environment will give its whiskers loads of data to process. This super awareness means cats can easily detect prey, find their way in the dark, or even leap onto a narrow ledge without falling off. Speaking of distance, whiskers are usually the same width as a cat's body and can help it figure out if it can s-q-u-e-e-z-e through a small space. Like a built-in measuring tape. The fatter the cat, the wider the whiskers!



Play and Learn

Next time you feed your cat, watch what happens. If your cat scoops food out of her bowl before eating it, she's probably experiencing “whisker stress.” Cats don't like it when their whiskers touch anything as they eat. Time to get a bigger bowl.

Why do dogs see in black and white?

They don't. They see colors, too—just not as many as you do. Inside a human eye you'll find cells called “cone cells.” They allow us to see color. We have three different kinds. Some are sensitive to red, some green, and others blue. Mixed together, the information collected by our cone cells zips to our brains and we see all the colors of the rainbow. But dogs have only two types of cone cells. They have fewer of them, too. As a result, a dog's world looks less vibrant—yellowish, bluish, and shades of gray.

Don't feel too bad for dogs, though. They have 300 million sensors in their noses (compared to our measly 6 million), so their sniffers are between 10,000 and 100,000 times more powerful than ours. Because dogs experience so much of their world through smell, seeing fewer colors doesn't slow them down.



Paws Off

Never cut a cat's whiskers! That would be like someone taking away your eyesight or sense of touch.



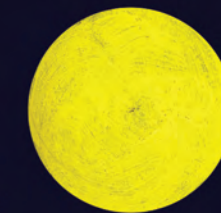


Why don't owls fly in the morning?

Because their meals are on the move at night! Owls are birds of prey. Some eat insects, but others hunt small mammals like mice, shrews, and voles. The largest owls swoop down and grab raccoons, possums, and other birds. Many of these yummy animals are nocturnal (active at night), so many owls must hunt at night in order to catch them. Owls have adapted to nighttime hunting by growing massive eyes to see better in the dark and sensitive ears to hear scurrying below. They've also perfected silent flight. And hunting at night means smaller owls are less likely to become meals themselves! By staying hidden during the day, they can avoid predators such as hawks.

But there are exceptions. Owls that spend time in the Far North and the Arctic hunt during the day because they have no choice. In the summertime, daylight lasts and lasts—in some places, the Sun doesn't set for months. If Arctic owls waited for darkness to hunt, they'd starve.

Why do scorpions glow under ultraviolet light?



Scorpions have scary-looking pincers and scaly armor, and some are even deadly poisonous. Not exactly the best pets. But they make great night-lights when sleeping outdoors!

Nearly all scorpions glow brilliant aqua and green as long as there's ultraviolet light (think electric black light or moonlight) shining on them. Scorpions have a hard protective layer outside their bodies called the "exoskeleton"—like a skeleton on the outside of the body. Its coating contains special fluorescent chemicals that absorb ultraviolet light's energy and turn it into an eerie gleam.

Scientists are still puzzled about why scorpions glow. Some believe it helps them find each other in the dark or that it confuses their prey. Maybe there's no point at all! It could just be a random fluke. After all, some rocks glow in ultraviolet light, too. Yet recent experiments show the glow might be like a warning light. It signals to the scorpion that it is not hidden well enough from predators in bright moonlight. Time to seek shelter!



Scorpions for Dinner

The southern grasshopper mouse might look cute and tiny, but if you're a scorpion, watch out! It might just EAT you. These mice not only howl like wolves but will also grab a scorpion, chew off its stinging tail—and dig in. Gulp.

Why don't wasps make honey?

Do you? Of course not. You're not a honeybee. Neither is a wasp.

Although bees and wasps have similarities—they both sting and buzz around backyards, interrupting our picnics—there are many differences between them. Bees love the calorie-dense honey they store in their hives. It's an excellent sugary food source to slurp in cold winter months when flower nectar isn't available. But wasps' lifespans are shorter. They die off when it gets cold. Only one wasp survives: the queen. She hides out in warm underground crevices or building cracks until spring, when she lays her eggs. Even so, many don't make it. Hibernating queen wasps make a tasty treat for spiders!

Wasps might steal honey from a beehive, but they don't make it themselves. Many are omnivores, feeding on small insects or drinking nectar and fruit juices for a quick energy hit.

Heavy Home

In warmer parts of the world, wasp colonies can grow . . . and GROW! One wasp nest found in Tasmania in 2015 weighed a scale-snapping 90 kilograms (198 pounds). That's as heavy as a fully grown male cougar!

Ask About . . . Solitary Wasps

Not all wasps live in colonies. Many species are "solitary wasps," and their eating habits can be pretty gross. Spider wasps sting and paralyze their prey, then give the victim to their babies . . . to eat alive!



Why do bees sting?

Nature has a way of giving creatures amazing tools to defend themselves. Turtles hide inside thick shells for protection. Porcupines grow pointy quills. Bees have defensive weapons, too: their stingers. They sting to protect themselves and the hives they live in. It makes sense. Honeybees spend nearly their entire lives making honey and tending to their baby larvae. Unfortunately for them, wriggly larvae, crunchy eggs, and syrupy honey make a delicious snack for many animals and other insects. Yum!

If bees couldn't protect the hives by stinging these scavengers and predators, all that work would be for nothing.

Honeybees have such a strong drive to defend their hives, they'll even destroy themselves in the process. Strong barbs on the stinger get stuck in the predator's skin. When the bee pulls away, the stinger and part of its tummy remain behind, and the bee dies. The good news? (At least for the bee!) Bees can sting other enemy insects without getting hurt.



What is the oldest animal on Earth?

That depends on what you mean by “oldest animal.” Fragile comb jellies and primitive sea sponges were two of the first creatures to evolve on the planet, and they still exist today. They’ve been around for over 500 million years! And speaking of sea sponges, some species live to be more than 2,000 years old. Scientists think the deep, frigid water causes less damage to their tissues and helps them live that long. But the oldest-underwater-creature award might go to the 5,000-year-old elkhorn coral found in Florida and Caribbean waters—older than the Egyptian pyramids of Giza!

So, what is the world’s oldest known land animal right now? His name is Jonathan, and he’s a giant tortoise living on the island of St. Helena. Nobody knows for sure how old he is since he was discovered when he was already fully grown, or at least 50 years old. But scientists estimate that the latest Jonathan could have hatched was in 1832. That means he was born nearly 30 years before the first true bicycle was invented!



Hungry, Hungry Tortoise

Jonathan might be going blind and deaf in his old age, but he still loves to eat. His favorite foods are lettuce, cabbage, cucumbers, apples, and carrots. He adores bananas, too, but they stick to the roof of his mouth!