Science for Little Hearts and Hands

Sparks and Stars

Parent Guide

The Good and the Beautiful Curriculum

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About This Course

Little children's hearts and minds are most impressionable during the preschool and early elementary years, so it's an important time for molding the way they view learning. Your enthusiasm while teaching in a positive and uplifting manner can help foster a love of learning and a desire for all things good and beautiful. This course strives to assist you in creating a solid educational foundation through fun, interactive, hands-on lessons that require minimal preparation.

What Does the Course Set Include?

- **Full-Color *Parent Guide***
- ***The Big Book of Science Stories: Sparks and Stars***

  The Big Book of Science Stories: Sparks and Stars contains beautifully illustrated stories that will inspire interest and wonder in a variety of science topics.

- **Lesson Audio Narrations**

  Lesson audio narrations are included and will be accessed every few lessons. These audio narrations share interesting facts about the topics studied in a fun and engaging manner.

How to Get Started with This Course

Note: We recommend that the lessons in this unit be completed in order. Several of the concepts that are introduced in the first few lessons are essential for the child to understand in later lessons.

No preparation time is required for this course. Some activities will need additional supplies, which are listed on pages 7–9.

Lesson Overview

The *Science for Little Hearts and Hands: Sparks and Stars* course consists of 30 lessons. Each lesson is parent directed and provides detailed teaching for young learners. The lessons are taught in story, audio narration, or activity format, with directions for the parent included in the lesson.

Lesson Text

To complete the lessons, simply follow the instructions on each page. Instructions in orange text are for you; text in black is what you read to the child.

Each lesson has a brief introduction and then instructs you to read one story from *The Big Book of Science Stories: Sparks and Stars*, listen to an audio narration, or complete an activity. Finally, you will return to this *Parent Guide* for discussion questions and optional activities.

The Big Book of Science Stories

If instructed to do so in the lesson, read the suggested story to the child and take time to enjoy the detailed illustrations. Every few lessons include a story from this resource.

Audio Narrations

Audio narration lessons can be found on the Good and Beautiful Homeschool app, which can be downloaded by scanning the QR code to the right or by visiting **goodandbeautiful.com/apps**. Alternatively, the audio narration lessons can still be found by going to **goodandbeautiful.com/hearts-and-hands** (password is “littles”). There are seven lessons throughout the unit that have audio narrations. In each of these lessons, you will be directed to remove and assemble the pawn from the perforated pages at the end of the unit. The child will use the pawn to follow along with illustrations that accompany the audio narration. The pawns do not need to be saved for future lessons.

Activities

Opening activities are listed at the beginning of each lesson, and optional activities are listed at the end of most lessons. Any supplies needed are listed on pages 7–9 and at the beginning of each lesson. Optional activities are not required but are offered as enhanced learning opportunities for you to complete with your child.

Important Safety Notice

The optional activities in this course may suggest using small items, such as dried beans. Please monitor all young children in your home around these items to prevent problems with choking. If you feel these items put any of your children at risk, do not use them.

Frequently Asked Questions

How long will a lesson take?

Lesson length will vary greatly among children. Have the child do as much work each day as the child's attention span will allow. You do not need to complete one lesson a day. You might do more or less than that. Look for cues of frustration or fatigue to help you know when to finish. The child will learn much from you as you display love, patience, and enthusiasm for learning. At this age it's important that the learning feels more like fun to the child than something forced or unpleasant.

Do you include any specific doctrine?

No, the goal of our curriculum is not to teach doctrines specific to any particular Christian denomination but to teach general principles, such as honesty, hard work, and kindness.

Is there anything I need to do to prepare for a lesson?

This course is written as an open-and-go course. Activity supplies are listed on pages 7–9, and access to the Good and Beautiful Homeschool app is needed for some of the lessons.

Activity Supplies

Lesson 1: States of Matter

- 3 large opaque cups (not glasses)
- small solid object
- small container of water
- access to water, stove, and freezer
- pot
- long oven mitts
- ice cubes

Optional Activity

- 1 clear plastic disposable cup per child
- permanent marker
- ice cream scooper
- vanilla ice cream
- root beer or other soda of choice
- straw or spoon

Lesson 2: Atoms and Molecules

- piece of paper
- scissors (optional)

Optional Activity

- blocks or other building toy

Lesson 3: Force and Motion

- toy car or any toy with wheels

Optional Activity

- wide plank of wood, cookie sheet, or a hard, flat surface
- paper towel
- parchment or waxed paper
- sandpaper

Lesson 4: Gravity

- small, light object, such as a crayon or paper clip
- larger, heavy object, such as a baseball or an orange
- a camera, such as a phone camera, capable of slow-motion video (optional)

Optional Activity

- butcher paper or 2 poster boards
- liquid watercolor paint
- bowl or small paper cup
- craft pom-poms
- chair

Lesson 5: Electricity

- balloon

Optional Activity

- large number of marbles or pom-poms
- jar

Lesson 6: Magnets

- strong magnet
- paper clip
- compass (optional)
- 2 magnets with opposing sides
- 5 small, nonmagnetic household objects
- 5 small, magnetic household objects (such as paper clips, screws, bolts, nuts, scissors)
- tape
- small toy car

Lesson 7: Space Travel, Satellites, and Rockets

- scissors
- straw for each child
- glue or tape

Lesson 8: The Sun

- small amount of sand
- large orange or grapefruit

Optional Activity

- tape
- empty paper towel roll
- paper plate
- pencil
- timer

Activity Supplies, cont.

Lesson 9: Mercury

- 10–15 crayons of different colors, shades, and lengths

Optional Activity

- bowl
- 1 c flour
- ¼ c salt
- 1 tsp vegetable oil
- ¼ c water
- small rocks

Lesson 10: Venus

Optional Activity

- flashlight
- mirror

Lesson 11: Earth

Optional Activity

- paper
- crayons

Lesson 12: Mars

Optional Activity

- steel wool pad
- cup
- vinegar

Lesson 13: Jupiter

Optional Activity

- 2 c milk
- bowl
- red food coloring
- yellow food coloring
- spoon
- dishwashing soap

Lesson 14: Saturn

Optional Activity

- toy hoop

Lesson 15: Uranus

- toy top

Optional Activity

- play dough
- aluminum foil, paper clips, or thin wire

Lesson 16: Neptune

- 4 small items, such as fish-shaped crackers or pieces of cereal
- 6-sided dice

Lesson 17: Asteroids and Meteoroids

Optional Activity

- 9"x13" baking dish or shallow tub
- several cups of dirt or sand
- variety of small, hard objects, such as balls, rocks, marbles, etc.

Lesson 18: Comets

Optional Activity

- 60 m (2 ft) ribbon
- chopstick or pencil
- aluminum foil

Lesson 19: Stars

- black construction paper
- pencil
- flashlight

Optional Activity

- blanket

Lesson 20: The Moon

- 1 sandwich cookie with cream in the center per child

Activity Supplies, cont.

Lesson 21: Poles and Auroras

- grape
- toothpick
- orange

Optional Activity

- piece of black paper
- blue, purple, and green pastels or chalk

Lesson 22: Solar Power

- 2 pieces of black construction paper

Optional Activity

- several old crayons of different colors
- paper plate
- aluminum foil
- 2–3 cookie cutters in different shapes
- paper

Lesson 23: Did You Hear That?

- paper
- pencil
- scissors
- 5 dominoes
- an empty tissue box or shoebox
- 3–4 rubber bands of varying thickness or size

Lesson 24: Simple Machines

- butter knife

Optional Activity

- play dough

Lesson 26: Farm Machines

Optional Activity

- thick, adhesive craft foam
- scissors
- ruler
- lint roller
- paintbrush
- brown paint
- large piece of white paper

Lesson 27: Airplanes and Things That Fly

Optional Activity

- piece of cardstock
- scissors
- ruler
- drinking straw
- tape

Lesson 28: Cars and Trucks

Optional Activity

- 12 pieces of cereal for game markers

Lesson 29: Trains

- masking tape

Optional Activity

- large paper plate or piece of cardstock
- dark-colored marker
- graham crackers
- round butter crackers
- triangular corn candy
- round cereal
- fun-shaped candies or vegetables (optional)

Lesson 30: Float or Sink

- 2–3 small, light items that can get wet
- 2–3 small, heavy items that can get wet
- large bowl or container filled halfway with water
- towel
- scissors
- ruler
- aluminum foil
- 25–40 coins or marbles

STATES OF MATTER

Supplies Needed

- 3 large opaque cups (not glasses)
- small solid object
- small container of water
- access to water, stove, and freezer
- pot
- long oven mitts
- ice cubes

Optional Activity

- 1 clear plastic disposable cup per child
- permanent marker
- ice cream scooper
- vanilla ice cream
- root beer or other soda of choice
- straw or spoon

OPENING

Have the child close his or her eyes. Place three cups on the table upside down in a row in front of the child. Place one cup over the solid object. Place the second cup over the small container of water. The third cup covers nothing. Read to the child: Open your eyes! Lift up one cup, and let's see what is underneath. **Read the appropriate prompt below as the child lifts up each cup.**

When lifting the cup that's empty: What do you see? It may seem like nothing, but there is air under this cup! Air is a gas.

When lifting the cup with the solid object: What do you see? Is it hard when you touch it? This object is a solid.

When lifting the cup with the water: What do you see? Touch the water. Water is a liquid.

Almost everything around us exists in one of these forms—gas, liquid, or solid. An easy way to remember these forms is with the phrase "**S**usan **L**ikes **G**umballs." The S in "Susan" is for "solids," the L in "likes" is for "liquid," and the G in "gumballs" is for "gas." Say that ten times in a row, and I bet you'll remember the three states of matter!

Read to the child: *Matter* is the word we use to describe what everything on Earth is made of. Trees, oceans, and even dogs are made of matter. Pencils, orange juice, and the air inside balloons are made of matter. Do all of the things I just listed feel, look, and act the same? **[Pause for discussion.]** There are three forms matter can take—we call these forms *states of matter*.

In what state of matter are each of the items in the picture below—solid, liquid, or gas? **Have the child point to each item and say its state of matter.**

Experiment Time

Note: This activity involves hot water and a hot pot. Please use extreme caution when allowing the child to handle these elements. Do not leave the hot water unattended at any time.

Read to the child: We see water in its different states all around us. On a trip to the lake in the winter, you might see water as a solid in the form of ice. You might also see water as a liquid in the form of lake water under the ice. And when you breathe out, your breath starts as a gas and then turns into steam or vapor! Let's do an experiment with water to see how it can change from one state to another. Have a pot on the stove and a large cup of water ready for the child.

1. First, we are going to change water from a liquid to a gas. You are going to dump this water into this pan. Have the child pour water from a cup into the pot. What do you think will happen as we heat up the water?

Turn on the stove and heat the water until boiling. Once the water starts to boil, turn off the stove.

Now that the water is boiling, what do you see above the pot? The liquid water is turning into a gas as it gets very hot. We call this steam. Be careful because steam can burn you, so don't get near it!

2. Using long oven mitts to avoid getting burned by the steam, carefully hold one of the cups used earlier upside down over the pot. We are about to see the process of condensation, which is when a gas—steam in this case—becomes liquid water again as it cools. What is happening on the surface of the cup?

Do you see the little droplets of water? Move the cup away from the pot, and then carefully hand it to the child. If it is too hot to hold, wait until it is cooler or hold it yourself and have the child watch. As the water cools more, the droplets will gather together into larger drops because water droplets like to stick together.

We have seen two changes. Let's see if we can create another change! How do you think we can make these water droplets become a solid? Just like the lake in the winter, once water gets cold enough, it freezes and becomes a solid. Where can we put this liquid water so it will become a solid?

Place the cup with droplets in the freezer and wait for it to freeze. Note: This may take up to fifteen minutes. You may want to complete the optional activity on the next page while you wait.

Leave the hot water in the pot for the next step.

3. Get out an ice cube and place it on the counter or table. While we wait for the droplets to freeze, let's see if we can make this solid ice cube into a liquid! What happens to a snowflake when it lands on your warm skin? It melts! Can we help this ice cube melt quickly?

We have some hot water on the stove. Let's place the ice cube in it. Carefully place the ice cube in the pot of hot water and have the child watch it melt. Did the solid water change its state again? What state is it in now? That's right—the solid changed forms to become a liquid.

4 Take the cup with water droplets out of the freezer. We have done it again! Our last change of state is from a liquid to a solid. What is the name of this solid? Yes! It is ice!

Sometimes, matter can skip one state and go straight to the next one. There is a special type of ice that can change directly from a solid to a gas without becoming a liquid first. It is called dry ice. Which picture below shows ice going from a solid straight to a gas? That's the dry ice, and it can be used to make a thick fog for movie scenes! Point to the picture that shows water becoming a liquid first.

OPTIONAL ACTIVITY: MAKE A TREAT

Read to the child: We can find the different states of matter in our food, too! Would you like to make a treat?

We're going to make a snack that will show all three states of matter we learned about today. Let's label our cups where the different states will appear. **Help the child use the permanent marker to label the states of matter in the treat. At the bottom, where the ice cream will be, write an "S" for the solid. In the middle, where the soda will be, write an "L" for the liquid. And at the top, where the bubbles will be, write a "G" for the gas. Show the child the letters and what they represent.**

First, we're going to put a scoop of ice cream in the bottom of your cup. What state of matter is the ice cream? [solid]

Place one scoop of vanilla ice cream into the bottom of the child's cup.

Next, we're going to pour some soda into the cup. What state of matter is the soda? [liquid]

Fill the cup halfway with soda.

Watch what happens as the soda runs over the ice cream. What formed on the top? Yes, bubbles are formed. What are the bubbles made of? [gas] Enjoy your states-of-matter treat!

Give the child a straw or spoon and let him or her enjoy the treat.

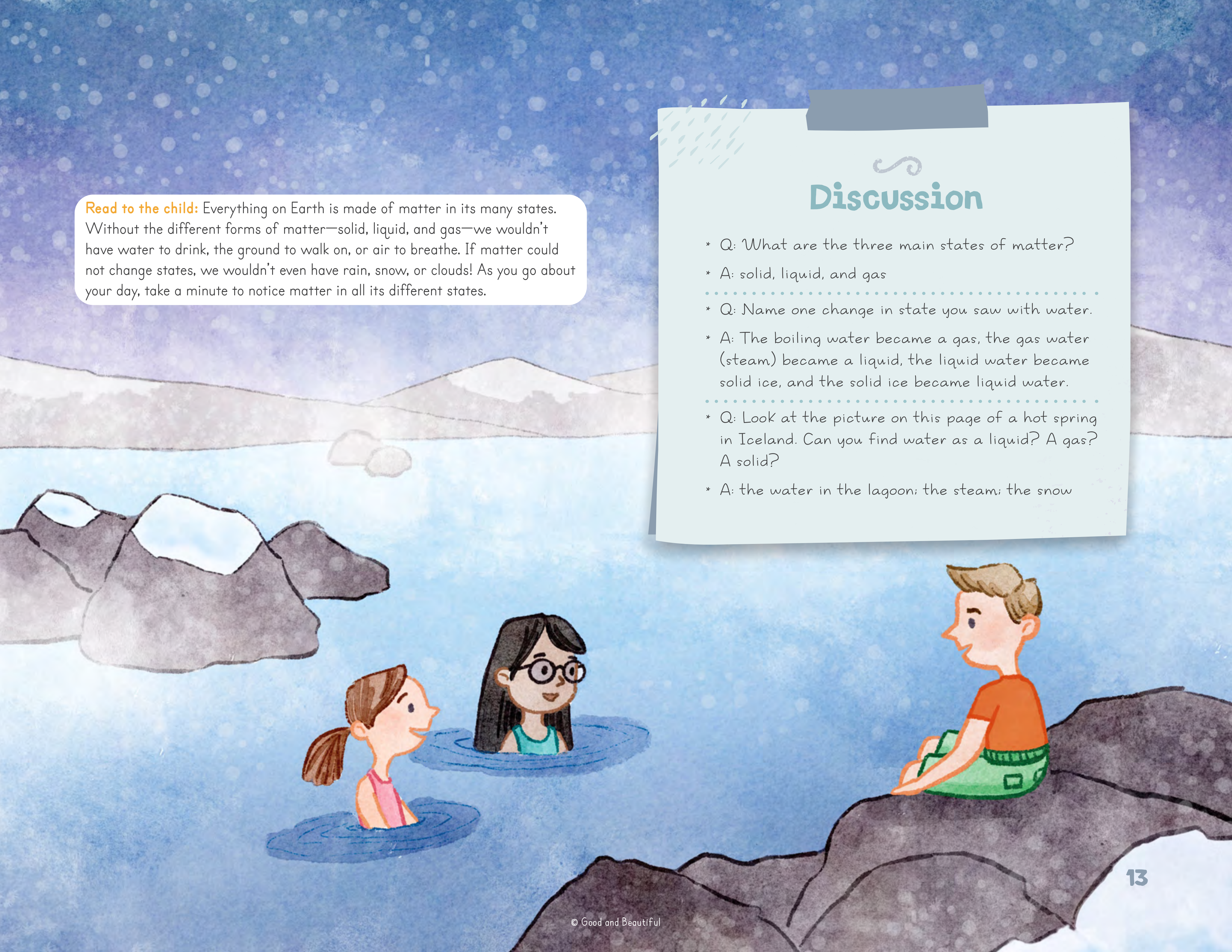
Read to the child: Everything on Earth is made of matter in its many states. Without the different forms of matter—solid, liquid, and gas—we wouldn't have water to drink, the ground to walk on, or air to breathe. If matter could not change states, we wouldn't even have rain, snow, or clouds! As you go about your day, take a minute to notice matter in all its different states.

Discussion

* Q: What are the three main states of matter?
* A: solid, liquid, and gas

* Q: Name one change in state you saw with water.
* A: The boiling water became a gas, the gas water (steam) became a liquid, the liquid water became solid ice, and the solid ice became liquid water.

* Q: Look at the picture on this page of a hot spring in Iceland. Can you find water as a liquid? A gas? A solid?
* A: the water in the lagoon; the steam; the snow



FORCE AND MOTION

Supplies Needed

- toy car or any toy with wheels

Optional Activity

- wide plank of wood, cookie sheet, or a hard, flat surface
- paper towel
- parchment or waxed paper
- sandpaper

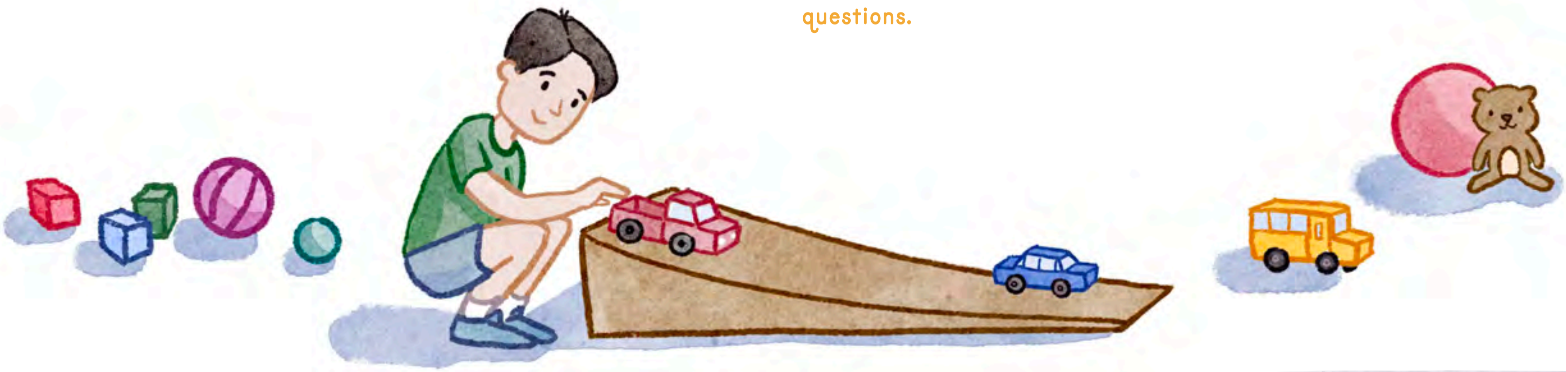
OPENING

Place a toy car or any other toy with wheels in front of the child. Read to the child: Is this toy moving? No, it's sitting still. Try to make the toy move by staring at it for a few seconds. Pause for the child to stare at the toy. Now try to make the toy move by thinking about it really hard. Pause for the child to try to move the toy by thinking. Were you able to move the toy with just your eyes or your thinking power? No, you weren't! Show me what you could do to make the toy roll. The child should push, pull, or otherwise move the toy with his or her body. You just used something called *force* to make the toy move!

Read to the child: When you were not touching your toy, it wasn't in *motion*, or moving from one place to another. As soon as you pushed or pulled the toy, it moved. You used *force*, an action that causes an object to change its motion, to move the toy. There are many different kinds of motions and forces, and they can be measured. Let's pretend to visit an amusement park to learn more about force and motion.

Audio Narration

Remove the Lesson 3 pawn from the perforated pages at the end of the unit. Listen to the audio narration "Force and Motion." Have the child start by putting the pawn on illustration number 1 on the next page. When the chime is heard, have him or her move the pawn to the next number by following the arrow. Turn the page when the third chime is heard to continue the narration. Afterward, have the child answer the discussion questions.




2
3
1
THRILLS AND CHILLS
$8
$13


4
5
6

Discussion

- Q: Name the force on Earth that keeps our feet on the ground.
- A: gravity

- Q: What needs to happen to an object for it to change its motion?
- A: Force must be applied to the object.

- Q: If you could design a ride for Newton's Thrills and Chills park, what kinds of motion and force would it have?
- A: Answers will vary.

Optional Activity

Have the child continue testing how force affects the motion of the toy from the opening activity. Make a ramp by using one end of a wide plank of wood, a cookie sheet flipped upside down, or another hard, flat surface. Place one end on top of something that is several inches off the ground, such as the edge of a couch or chair, and the other end on the floor. Have the child roll the toy down the ramp several times, altering the force he or she uses to push the toy, the height of the ramp, etc. Next, have the child line the ramp with other materials, such as a paper towel, parchment or wax paper, or sandpaper, to test how different amounts of friction affect the speed and direction of the toy.

THE SUN

Supplies Needed

- small amount of sand
- large orange or grapefruit
- empty paper towel roll
- paper plate
- pencil
- timer

Optional Activity

- tape

OPENING

Have the child stand outside in the sunlight on a sunny day for a few seconds. Then have the child slowly spin in a circle. Go back inside. Read to the child: What did the sunlight feel like? The sun's warmth reaches us because the sun is so big and hot. Did you feel the warmth and light reach each side of you as you spun? When something spins like this, it is called *rotation*.

Even though the sun looks like a small orange ball in the sky from Earth, it's actually much, much bigger than our planet. **Place a few grains of sand and a large orange or grapefruit in front of the child.** If the sun were the size of this fruit, then Earth would be the size of just one of these grains of sand.

Read to the child: Earth is warmed by a star called the *sun*. Our magnificent sun provides us with heat, life, and light. The sun is the center of our solar system, and without it, we wouldn't be able to live on Earth. God placed the earth at the perfect distance from the sun.

Story Time

Read to the child: Today we will join Kiara as she learns about how important our closest star, the sun, is to Earth.

Read to the child "Kiara's Sunrise" on page 50 of *The Big Book of Science Stories*, and then return to the *Parent Guide* for discussion questions.

Discussion

* Q: Why do we have night and day?
* A: The earth is spinning on its axis, making one complete turn each day. The side of the earth that faces the sun has daylight, while the side that faces away from the sun experiences nighttime.

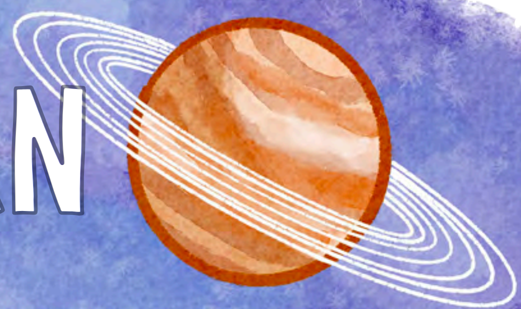
* Q: How does the sun create our seasons?
* A: As Earth goes around the sun, certain parts of the world get more direct sunlight, making them warmer and creating their spring and summer seasons.

* Q: Why are you grateful for the sun?
* A: Answers will vary.

Optional Activity

Tape an empty paper towel roll standing up on the middle of a paper plate. Set this outside on a sunny day with the paper towel roll facing up. Have the child trace where the shadow falls. Leave the plate in the same spot, and set a timer to check it every two hours throughout the day. Discuss that the shadow moves as the day goes by because the earth is spinning, causing the sun to hit the paper towel roll at different angles.

SATURN



Supplies Needed

Optional Activity
- toy hoop

OPENING

Read to the child: As you listen to the riddle below, look at the planets along the bottom of this page to try to figure out which one is Saturn.

I am a planet far out in space.

I am not first or last in the race.

I am not the biggest, but I am not small.

I am circular and round, but not just a ball.

Some think I have handles or maybe big ears,

But they are just rings I've had circling for years.

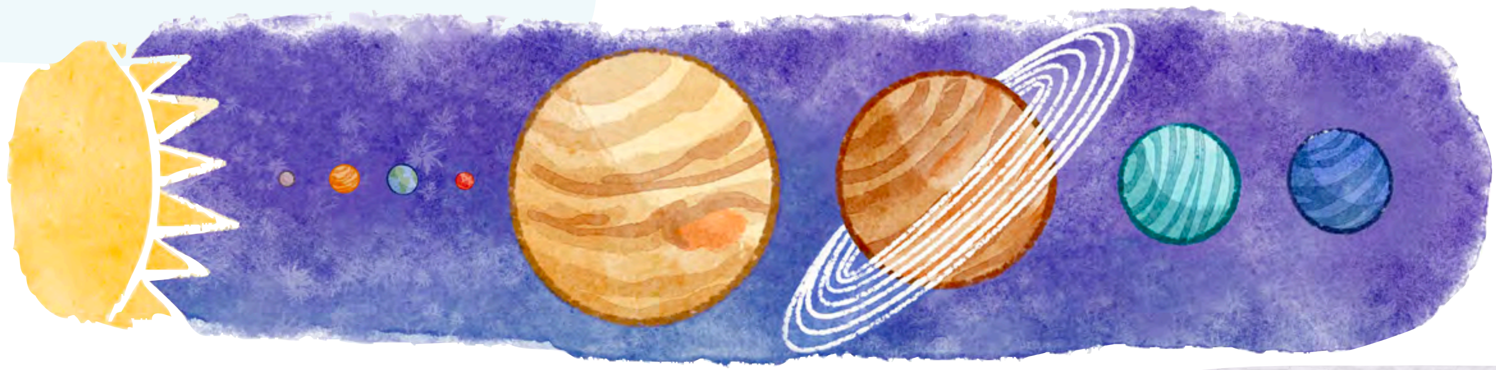
What's my name? Can you point to me?

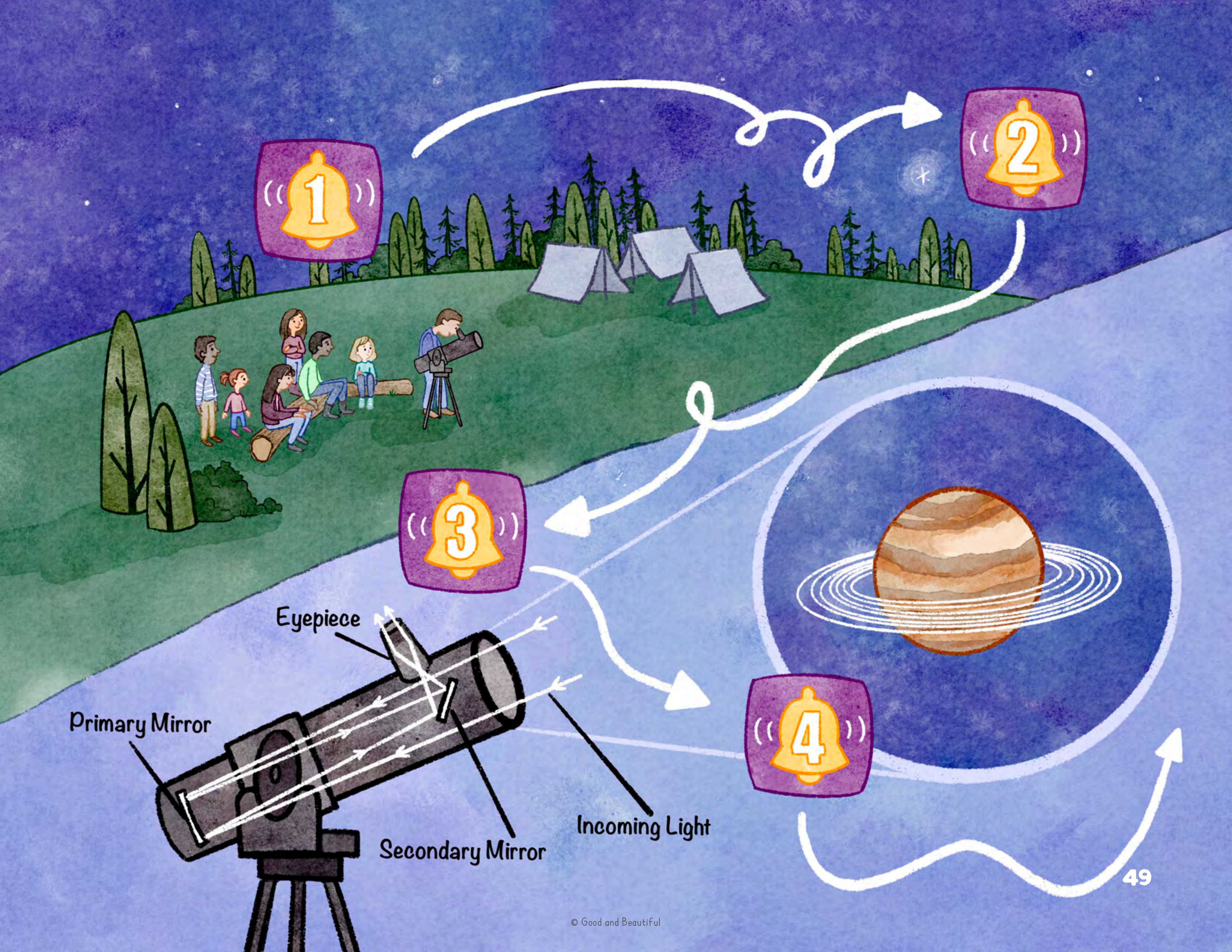
I am Saturn, the sixth planet from the sun, you see!

Read to the child: Saturn is the planet with big rings around it that can be seen with a telescope. What else do you notice about it in the picture below? **The child might notice that it is almost as big as Jupiter, that it is far from the sun, or that it seems slightly tipped.** We will learn more about this fascinating planet as we listen to today's audio narration.

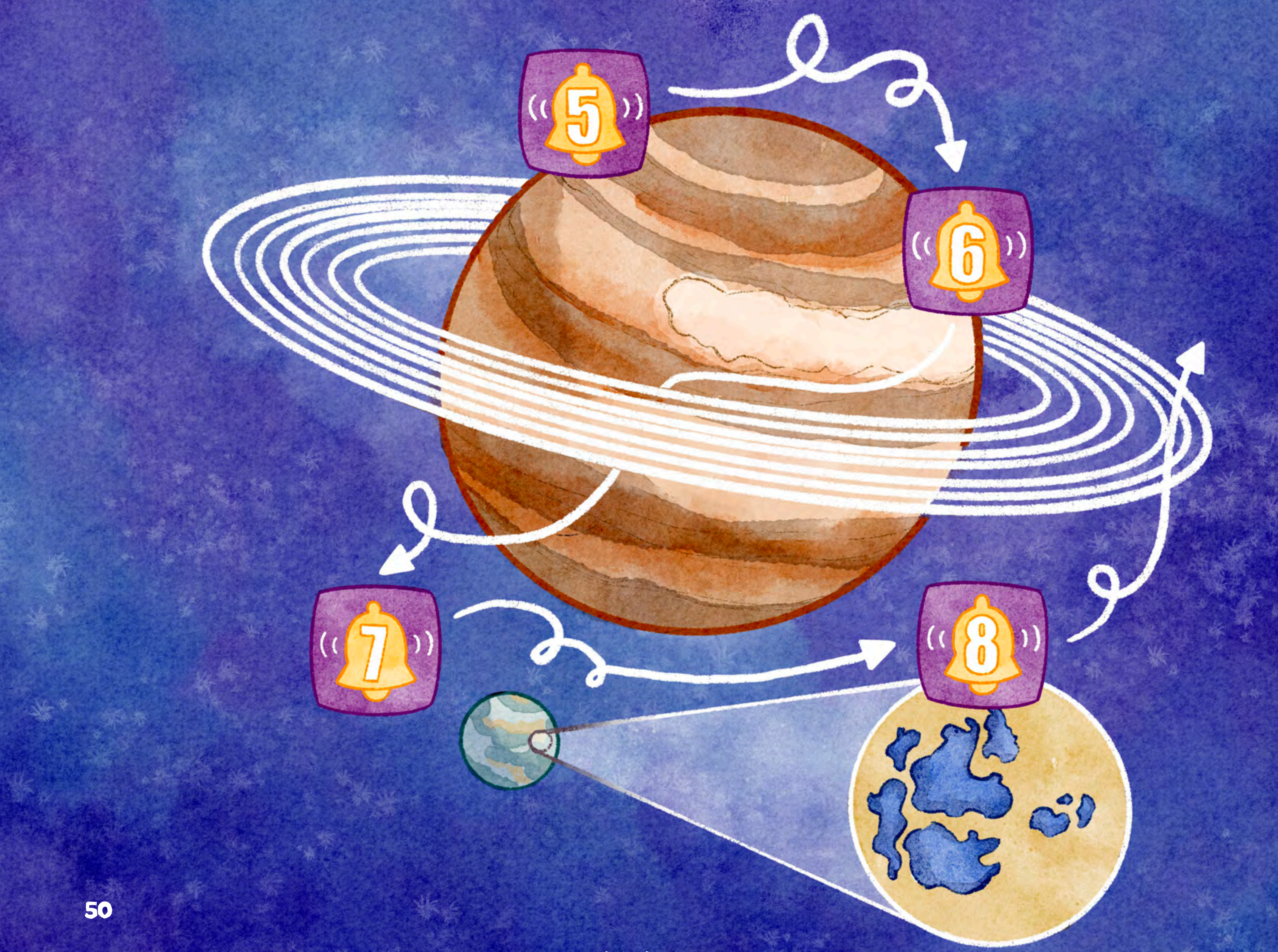
Audio Narration

Remove the Lesson 14 pawn from the perforated pages at the end of the unit. Listen to the audio narration "Saturn." Have the child start by putting the pawn on illustration number 1 on the next page. When the chime is heard, have him or her move the pawn to the next number by following the arrow. Turn the page when the fourth chime is heard to continue the narration. Afterward, have the child answer the discussion questions.





1
2
3
4
Eyepiece
Primary Mirror
Secondary Mirror
Incoming Light


5
6
7
8

Discussion

* Q: How many planets away from the sun is Saturn?
* A: Saturn is the sixth planet from the sun.

* Q: What do scientists think Saturn's rings are made of?
* A: comets, moons, and asteroids that were broken up by Saturn's gravity

* Q: If you had been the first person to see Saturn's rings, what would you have called them?
* A: Answers will vary.

Optional Activity

Use a toy hoop to try to make a ring spin around your body. Remember that Saturn has rings spinning around it. The planet's gravity helps keep the rings in place and spinning around without falling or drifting away into space. See if you can keep a toy hoop up around you just like Saturn keeps its rings spinning around itself.

COMETS

Supplies Needed

Optional Activity

- 60 cm (2 ft) ribbon
- chopstick or pencil
- aluminum foil

Read to the child: *Comets*, sometimes called cosmic snowballs, are made of frozen gas, rock, and dust. Like planets and moons, comets orbit the sun, and though they look small from Earth, they can be very large.

OPENING

Read the poem to the child:

Comets

By Lyndsey Casaceli

Thousands of comets in the sky,
Zipping and zooming up so high.
Made of rock, dust, and frozen gas,
Through the solar system they pass.
With their two long tails so bright,
They are, for sure, a universal delight.

If desired, reread the poem one line at a time, asking the child to repeat each line after you.

Story Time

Read to the child: Today we will join Ben as he uses his new telescope to discover something amazing in the night sky.

Read to the child "Cosmic Snowballs" on page 126 of *The Big Book of Science Stories*, and then return to the *Parent Guide* for discussion questions.

Discussion

* Q: What are comets made of?
* A: frozen gas, rock, dust

* Q: Look at the larger comet at the bottom of the opposite page. Can you point to the nucleus? The coma? Can you find the dust tail and the ion tail?
* A: Refer to the comet diagram on page 136 in *The Big Book of Science Stories* for correct answers.

* Q: What do you think Ben and Mr. Peterson saw in the telescope the next night?
* A: Answers will vary.

Optional Activity

Cut a piece of ribbon about 60 cm (2 ft) long. Using a double knot, tie the ribbon to the top of the chopstick or pencil at the halfway point of the ribbon. This will make two lengths of ribbon coming from the stick. Cut two squares of aluminum foil, each about 15x15 cm (6x6 in). Squeeze the first square of foil into a ball around the end of the chopstick or pencil, covering the ribbon knot. Squeeze the second piece of foil around the first one. The child has made a comet! Explain to the child that the aluminum foil represents the comet's nucleus and coma, while the ribbons represent the dust tail and the ion tail. Have the child take the comet through space by holding the end of the chopstick or pencil and running with it up in the air!

POLES AND AURORAS

Supplies Needed

- grape
- toothpick
- orange

Optional Activity

- piece of black paper
- blue, purple, and green pastels or chalk

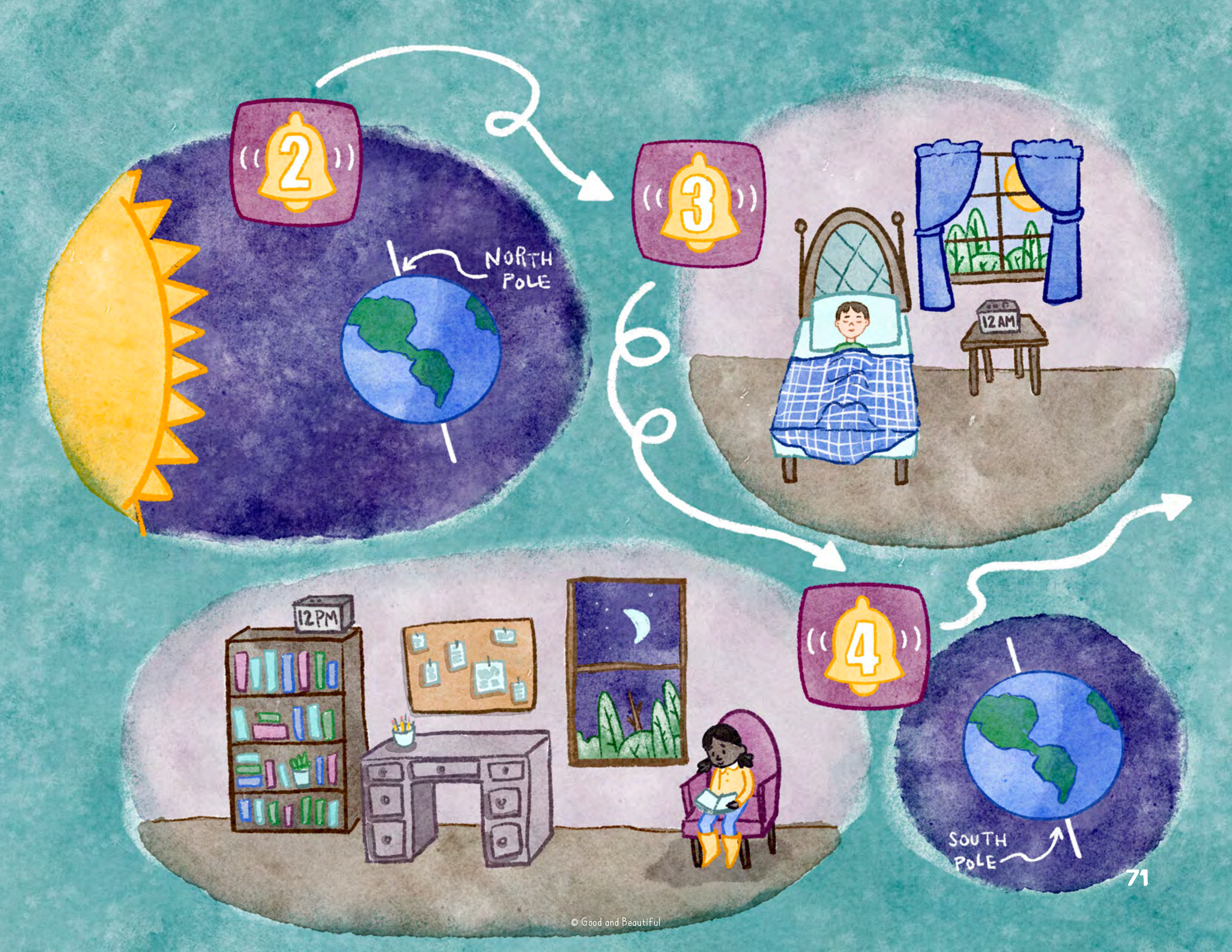
OPENING

Hand the child a grape and a toothpick. Read to the child: We're going to pretend that this grape is the earth. **Have the child stick the toothpick through the grape from top to bottom.** The toothpick is like the earth's *axis*—an imaginary line that runs from the top of the planet, called the *North Pole*, through the middle, and to the bottom, called the *South Pole*. But the earth doesn't sit straight up and down in space, so let's tilt it a little bit. **Have the child slightly tilt the grape. Hold the orange next to the grape so that the top of the grape is tilted toward the orange.** Pretend this orange is the sun. Which pole is tilted toward the sun? [North] Which one is tilted away from the sun? [South] **Have the child tilt the grape the other way so the bottom is closer to the orange.** Now which pole is getting the most sun? [South] The least sun? [North]

Read to the child: The North and South Poles are on opposite ends of the earth. During certain parts of the year, one pole is tilted so far away from the sun that it is dark all day and night, while the other is tilted so far toward the sun that it is light all day and night. Sometimes dazzling, colorful displays of light appear among the stars in these areas. How does this happen? Let's discover as we listen to the next audio narration.

Audio Narration

Remove the Lesson 21 pawn from the perforated pages at the end of the unit. Listen to the audio narration "Poles and Auroras." Have the child start by putting the pawn on illustration number 1 on this page. When the chime is heard, have him or her move the pawn to the next number by following the arrow. Turn the page when the fourth chime is heard to continue the narration. Afterward, have the child answer the discussion questions.


2
NORTH POLE
3
12 AM
4
12 PM
SOUTH POLE


5
6
7
8

Discussion

- Q: How often does the sun rise and set at the North Pole and South Pole?
- A: The sun rises and sets once a year.

- Q: If you could, would you like to live near the North or South Pole?
- A: Answers will vary.

- Q: Aurora borealis is the scientific name for what?
- A: the northern lights

Optional Activity

Create your own aurora! On a black piece of paper, draw some thick, squiggly lines horizontally across the top half with the blue pastel or chalk. Next, alternate the purple and green pastels or chalk to make a thick dashed line right under the blue line. Use a finger to smear the lines upward, starting at the green-and-purple line and going in a curved, vertical motion. Draw mountains or grass and trees at the bottom of the paper to complete the aurora scene.

MOTORS AND ENGINES

Supplies Needed

* none

OPENING

Have the child run across a safe, open space inside your home or building. Read to the child: You just used your arms and legs and energy to move quickly across the floor. What will happen if you try to run without moving your arms? Have the child try to run back across the space without using his or her arms. Was that easier or harder than running with your arms? People need moving parts, such as arms, to be able to move properly.

Would you be able to run as fast if you had not eaten any food today? Food gives people's arms, legs, and the rest of their bodies energy to move.

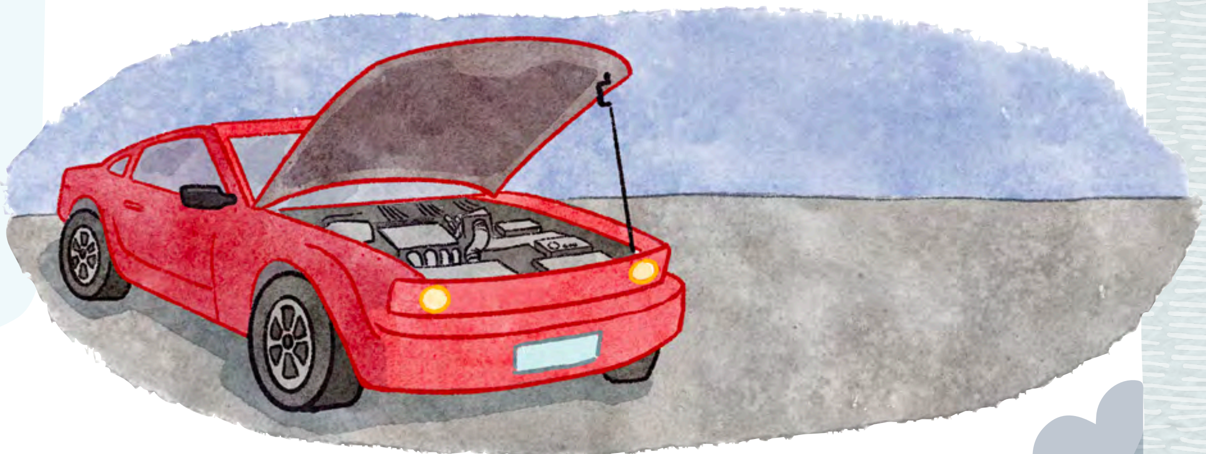
Machines like cars and washing machines also need energy and parts that move in order to drive the car or wash a load of clothes. These moving parts are called *engines* or *motors*, and they get their energy from electricity or something called fuel.

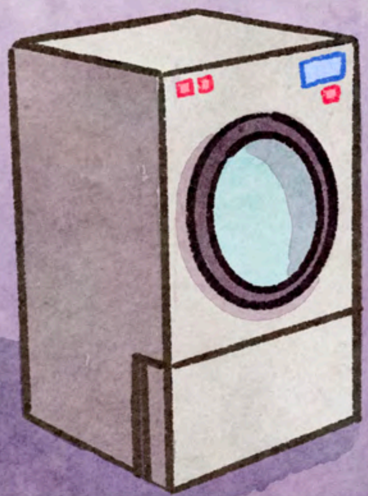
Read to the child: You've heard the roar of an engine or motor before—they can be very loud! Both motors and engines make cars, trucks, planes, and even refrigerators work. Even though we like to use both words to mean the same thing, motors and engines have one big difference—what they use for energy. Motors use electricity for energy, and engines use fuel for energy. Motors and engines are super important to people's everyday lives!

Story Time

Read to the child: Today we will help José and his robotics team solve a mystery!

Read to the child "The Mystery of the Missing Motor" on page 174 of *The Big Book of Science Stories*, and then return to the *Parent Guide* for discussion questions.



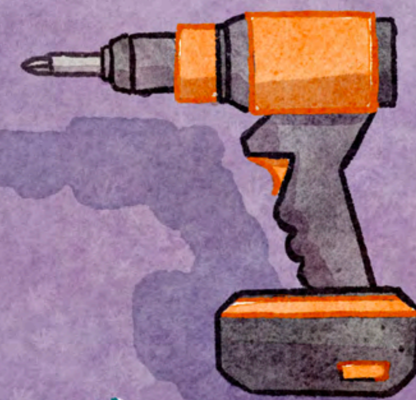


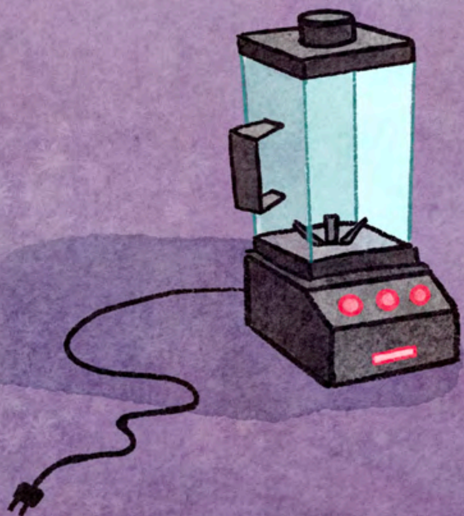
Discussion

- Q: True or false: A machine can move on its own without an engine.
- A: false

- Q: How did the steam engine on Jonathan's robot make energy to turn the wheels?
- A: The engine boiled water until it turned into steam. The steam pushed the piston, which turned the wheels.

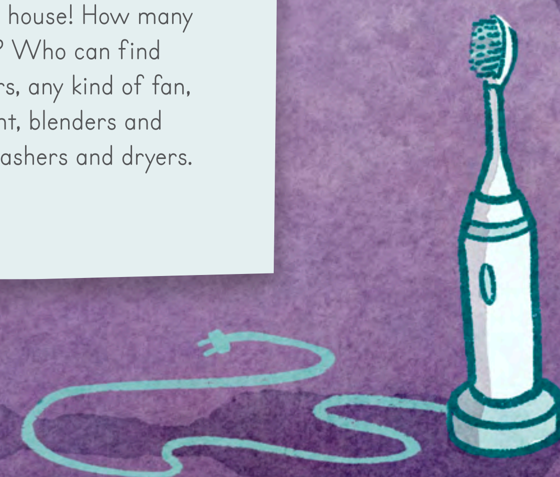
- Q: If you could build a robot with any kind of motor or engine, what kind would you choose? Why would you choose that one?
- A: Answers will vary.





Optional Activity

Do a motor-and-engine scavenger hunt in the house! How many objects in your house have motors or engines? Who can find the most objects? Examples include hair dryers, any kind of fan, refrigerators, air conditioners, lawn equipment, blenders and mixers, vehicles, power tools, vacuums, and washers and dryers.



LESSON 30

FLOAT OR SINK

Supplies Needed

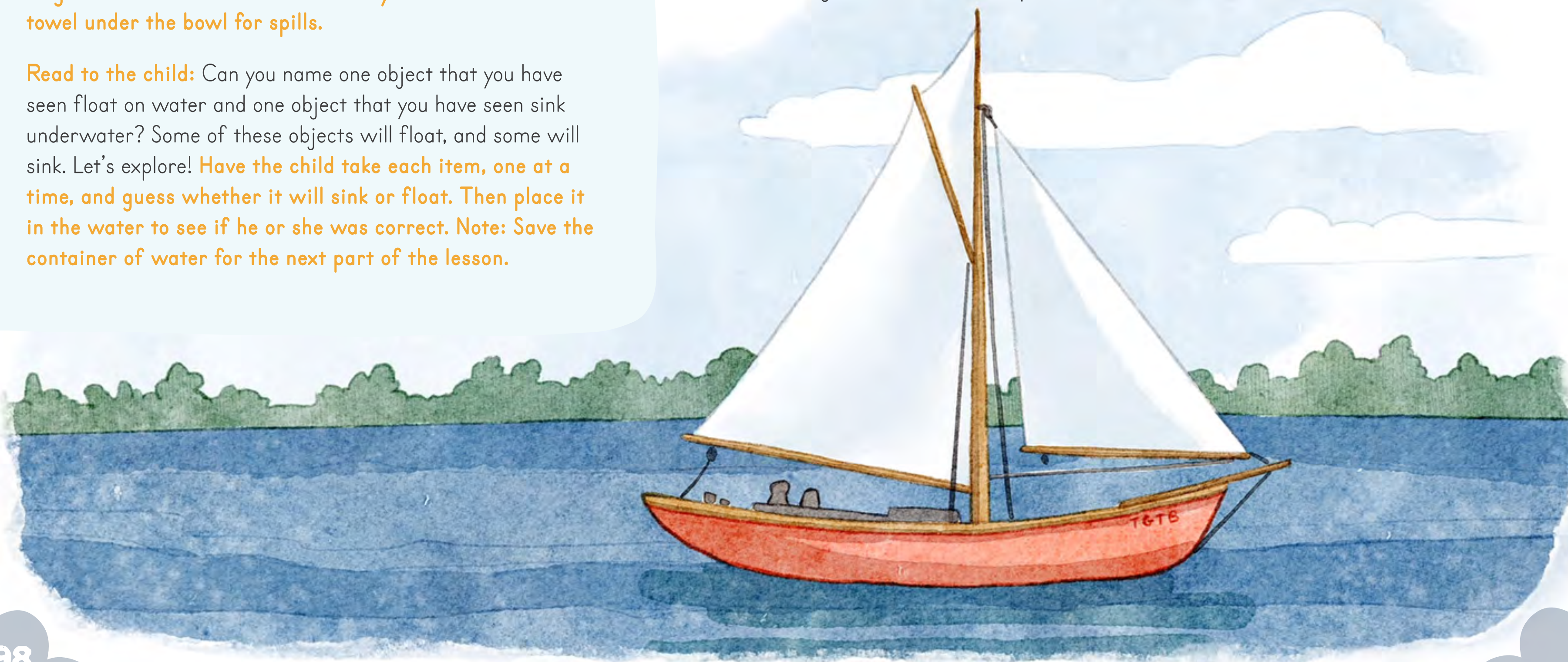
* 2–3 small, light items that can get wet
* 2–3 small, heavy items that can get wet
* large bowl or container filled halfway with water
* towel
* scissors
* ruler
* aluminum foil
* 25–40 coins or marbles

OPENING

Place 4–6 small items that can get wet on the table with a large bowl or container filled halfway with water. Place a towel under the bowl for spills.

Read to the child: Can you name one object that you have seen float on water and one object that you have seen sink underwater? Some of these objects will float, and some will sink. Let's explore! **Have the child take each item, one at a time, and guess whether it will sink or float. Then place it in the water to see if he or she was correct. Note: Save the container of water for the next part of the lesson.**

Read to the child: Why do you think some of your items sank and others floated? How heavy an object is has a lot to do with whether it will float or sink, but even very heavy things, like large ships, can float on water. Do you think an object's weight is the only thing that determines if it will float? Let's figure it out with an experiment!



Experiment Time

Read to the child: What happens to the water in the bathtub when you climb in? [The water rises.]

When an object is put into water, the water has to move out of the way to make room for the object. This makes the water rise higher.

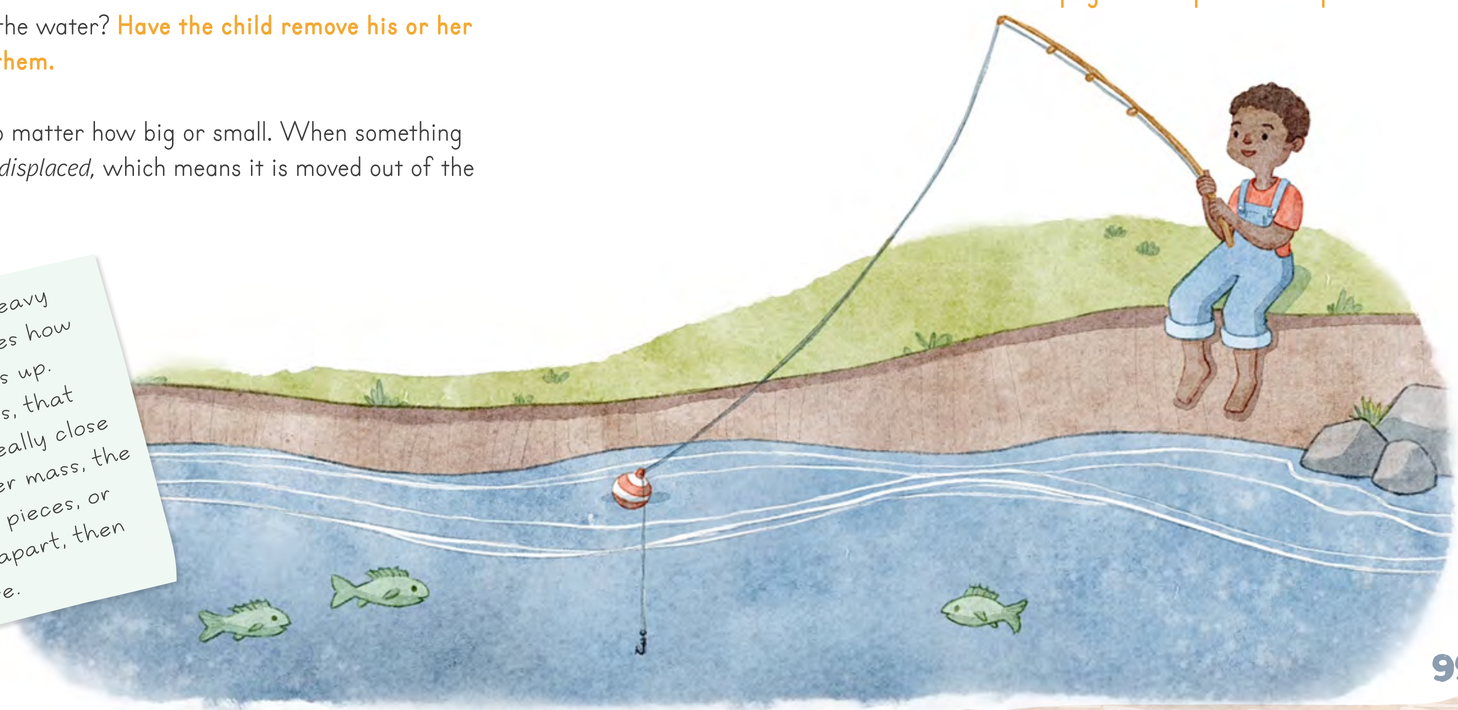
Let's try it! First, notice how high the water is in the bowl right now. **Have the child look at the bowl used in the opening activity of the lesson. Discuss with the child where the water level is. Then have the child place both hands into the bowl and watch for the water to rise.** Now how high is the water? **Have the child remove his or her hands from the water and dry them.**

This happens with everything, no matter how big or small. When something is put into water, some water is *displaced,* which means it is moved out of the way. If the item in the water is lighter (or less dense) than the amount of water that is being pushed aside, it will float! But if the item is heavier (denser) than the amount of water that is being pushed aside, it will sink!

A crumpled-up piece of aluminum foil pushes aside more water than the same size of foil left uncrumpled. Try it!

Look at the boy who is fishing. The bobber floats on top of the water because it is less dense than the water that is being pushed away. Do you see the hook? Even though it is smaller than the bobber, it is heavier and denser than the amount of water it pushes away, so it sinks.

We are going to make a boat that will float. Then we will see how much weight it can carry before it becomes heavier than the water that it is displacing, or pushing away. When it becomes denser than that amount of water, our boat will no longer be *buoyant,* or able to float, and it will sink. Are you ready to float a boat? **Follow the directions on the next page to complete the experiment.**



Density is more than how heavy something is. It also includes how much space the item takes up. If the pieces, or molecules, that make up an object are really close together or have a larger mass, the object is denser. If the pieces, or molecules, are spread apart, then the object is less dense.

BUILD a BOAT

Guide the child in completing the following steps to build a boat with aluminum foil:

1. Using scissors and a ruler, cut a piece of aluminum foil to 30.5x15 cm (12x6 in). Fold each long side toward the center about 3.8 cm (1.5 in).

2. Fold the entire piece in half (so that the folded sides meet).

3. Take one of the short sides and fold it in about 0.6 cm (0.25 in), and then roll it over that same edge two more times. Do the same thing to the other side.

4. Pull apart the opening and pinch down the center of each long side of the boat so that the center of each side is shorter than the ends where the aluminum foil meets.

5. Flatten out the bottom of the boat.

Changing an object's shape can change how dense it is and cause it to sink or float. For example, modeling clay rolled in a ball will sink, but if you stretch it out into a dish, it will float.

FLOAT a BOAT

Have the child place his or her boat in the water and add coins or marbles into the boat, one at a time. Have the child count how many he or she can add to the boat before it sinks.

If you change the shape or size of your boat, what happens?

What else can your boat carry?

Try it!

Discussion

- Q: Did your boat float for a longer or shorter time than you thought it would?
- A: Answers will vary.

- Q: If you made your boat wider, would it float better?
- A: Yes—it would take up more space. This means more water has to move, which allows for more weight to be carried by the water.

- Q: From what you have learned, name some items you think would float and some that you think would sink.
- A: Answers will vary.

Science for Little Hearts and Hands

THE BIG BOOK of SCIENCE STORIES

SPARKS and STARS

The Good and the Beautiful
CURRICULUM

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Ava's Tower of Atoms

Illustrated by
Bojana Stojanovic

Ava stepped into the schoolroom one sunny afternoon, searching for her favorite doll. She remembered using Dolly to help her answer her math facts earlier that morning. But Ava stopped short when she entered, noticing her mother hanging a large poster on the wall. The room was cozy, with bookcases lining the far wall and a calendar and charts decorating the wall where her mother was standing. A table sat in the middle of the room, and Dolly was sitting neatly on one of the chairs.

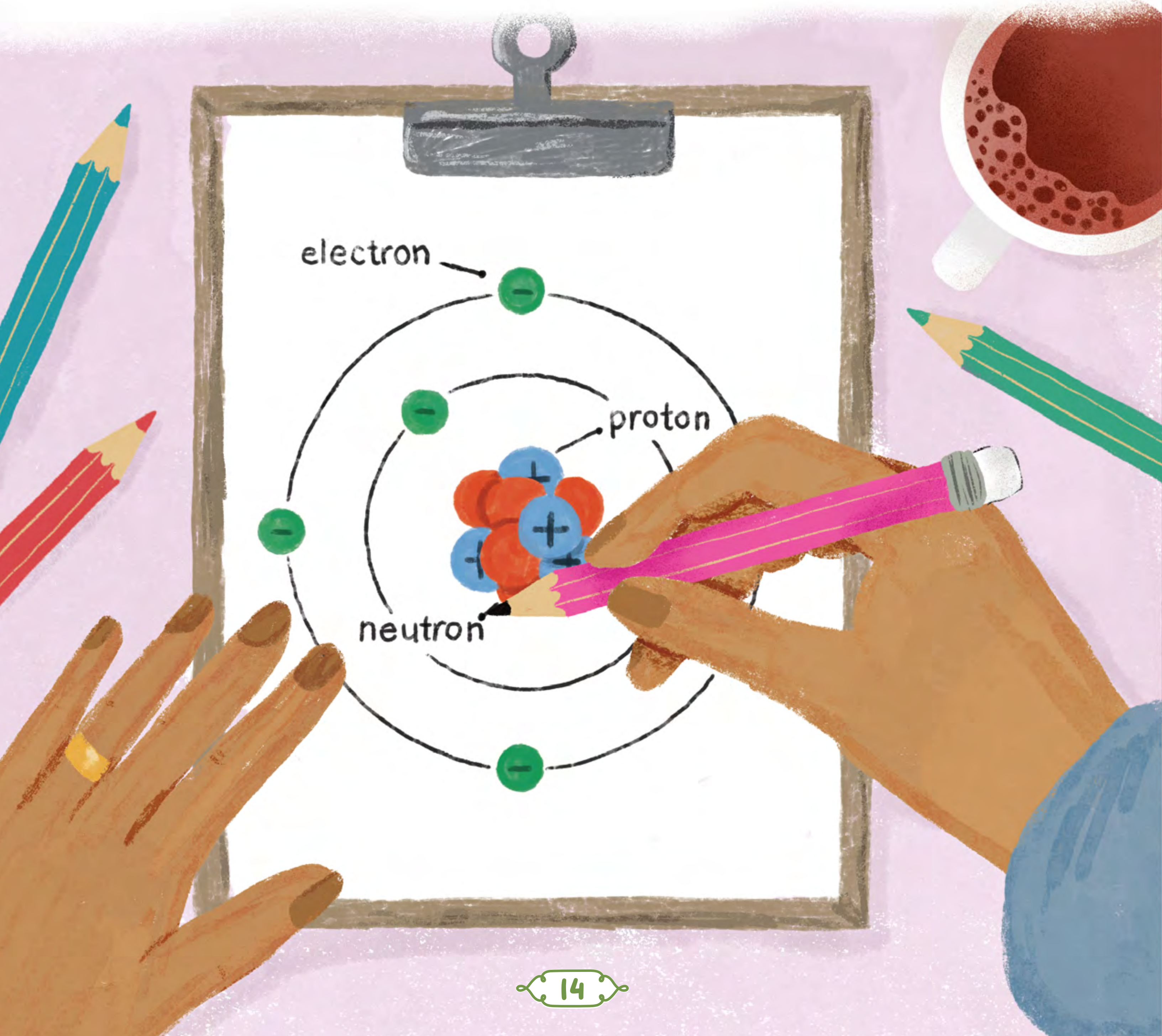
Ava was happy to see Dolly and scooped the doll up as she walked past, but she was more interested now in what her mother was doing with the large poster. Her mother occasionally swapped out posters on the walls when they learned about new subjects, and any kind of change was always exciting. The new poster had different-colored boxes all over it and letters too, but it wasn't any kind of alphabet or number chart Ava had ever seen.

“An atom has three basic parts: protons, neutrons, and electrons. The protons and neutrons clump together in the middle to make what is called a nucleus, while the electrons surround the nucleus in layers called shells,” Mom explained.

“How does that connect to the chart you were putting up?” Ava asked.

“Let’s explore more, and I think you’ll understand. Look at these blocks Olivia is playing with. Each block is kind of like an atom. Do all the blocks look the same?”

Ava shook her head no.



Mom continued, “If I stacked all the pink blocks together, it would be like making a group of one kind of atom. A group of atoms that are all the same kind makes an element. The periodic table you were looking at shows all the different types of elements on the earth. You have seen many elements in real life. The gold in my wedding ring is an element, which means that it’s made up of only one kind of atom.”

"Oh, so each one of those boxes stands for an element? How many are there?" Ava asked.

"Scientists have discovered 118 elements so far. The different elements can work together to make something new, though. What if we built something out of different colors of blocks, such as a tower? The tower would be like us building something called a molecule, which can be made up of more than one element. The elements work together to build everything in our world. Pretty amazing, right? Elements can rearrange to form new molecules, just like these blocks can rearrange to build new things."

“Wow. That is a lot of information. Maybe I will need to listen in on the chemistry lessons next week to understand it better. Thanks for teaching me a little, though. Want to have a competition to see who can build the tallest block tower without it falling over?” Ava asked.

“Definitely! Let’s go!” Mom smiled and began stacking blocks.

Ava began stacking her blocks quickly too. Olivia’s was already getting tall, but as Ava added layers to hers, it fell with a clatter just after. They all giggled in the pile of blocks.

FUN FACTS ABOUT

ATOMS AND MOLECULES

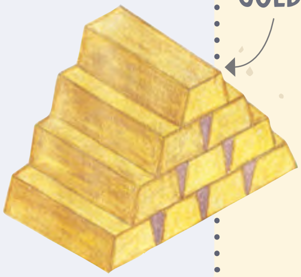
Our bodies are made up of atoms. There are so many in every body that it is almost difficult to think about. Even a baby has trillions upon trillions of atoms that make up his or her body.

Each element has its own **atomic number** on the periodic table. This number describes how many protons the element has in its nucleus. Gold has 79 protons in its nucleus, so its atomic number is 79.

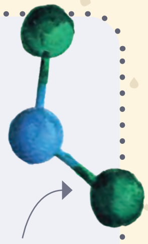
79
Au
Gold

The tiny electrons inside atoms can actually move around, and they sometimes jump from one atom to another.

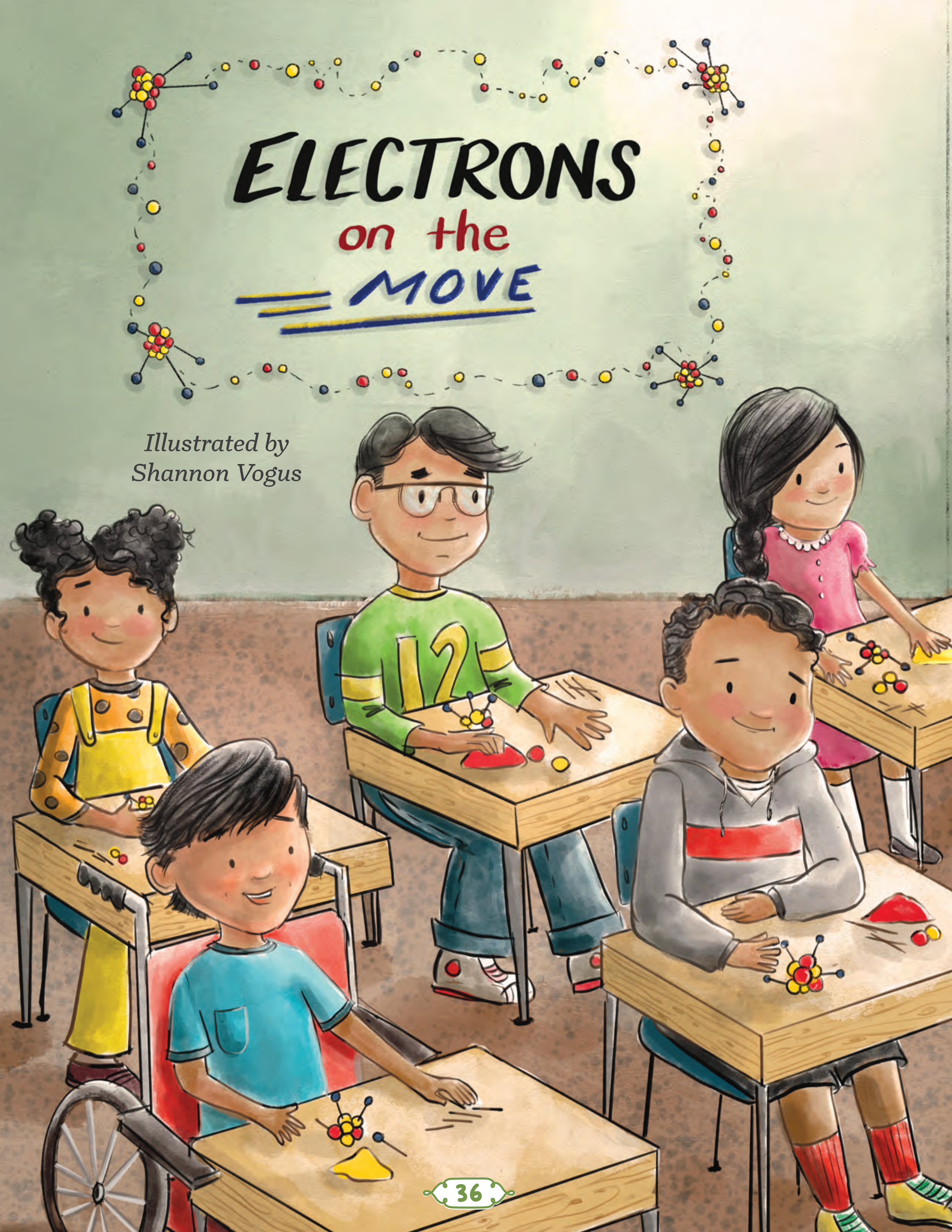
The elements on the periodic table exist in different states of matter. Some of the elements, such as hydrogen and oxygen, are gases. Some are solid metals, such as gold and iron. Mercury and bromine are two elements that can exist as liquids.



When atoms come together, they form something called a **molecule**. When two atoms of hydrogen are joined with one atom of oxygen, a molecule of water is created!



There are more atoms of hydrogen than any other kind of atom in the universe. There are hydrogen atoms inside all the parts of our bodies. There is a little bit of hydrogen in the air we breathe. Even the water we drink and take a bath in is made up of lots and lots of hydrogen atoms!



Illustrated by Shannon Vogus


ATOM
PROTON

It was raining outside as Miguel and his two best friends, Bruno and Carmen, entered their science classroom. Today was experiment day—Miguel's favorite day of the week.

As the three children reached their desks, they noticed little balls of different colors and sizes of play dough sitting on their desktops. Next to the play dough were handfuls of toothpicks.

When they had taken their seats, their teacher, Mr. Gomez, said enthusiastically, "Today we are going to build atoms!"

Mr. Gomez began, “All matter on Earth is made from tiny things that can’t be seen without microscopes, called atoms. In the center of an atom is a nucleus with even smaller particles called protons and neutrons. Let’s make a nucleus.”

Grabbing a handful of yellow and red play-dough balls, Mr. Gomez very gently pressed them together. “The red balls will be our protons, and the yellow balls will be our neutrons,” he explained. Everyone began working on their atom models.

Venus and Volcanoes

Illustrated by Shannon Vogus


·PLANETARIUM·

Kevin slides on his shoes in a rush and grabs his water bottle off the counter. He skips out the front door and hops into the van, clicking his seatbelt.

"Ready, Kevin?" Mom asks, turning around with a grin.

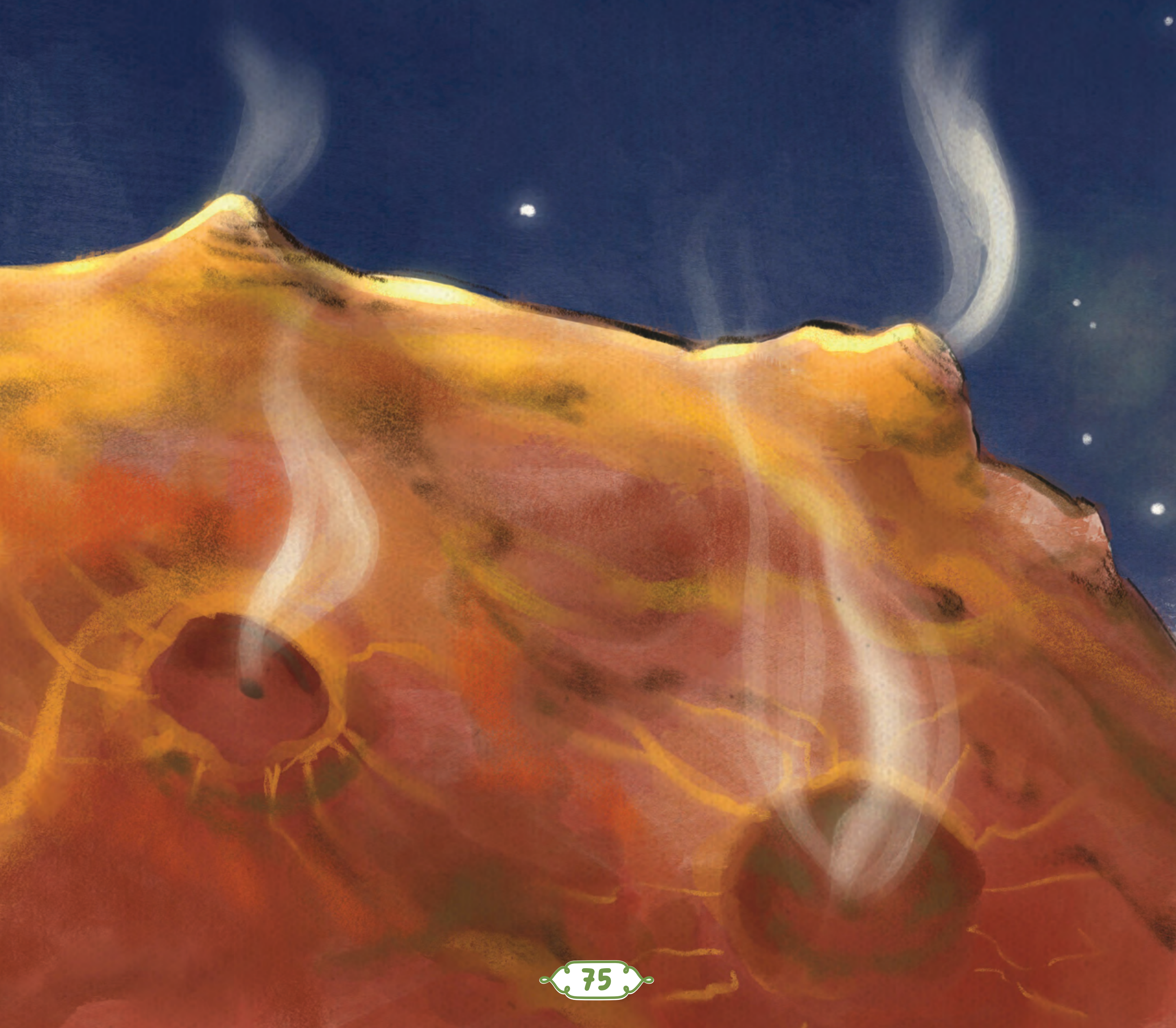
"Definitely! I can't wait for this field trip!" he replies, wiggling excitedly in his seat.

"Go, go, go!" Kevin's baby sister, Eleanor, chants from her car seat. Mom and Kevin laugh at how excited she is as they pull out of the neighborhood. Today, they are meeting up with their homeschool group at the local planetarium, which is a theater shaped like a dome that shows videos about space on the ceiling. Kevin doesn't think they can get there fast enough.

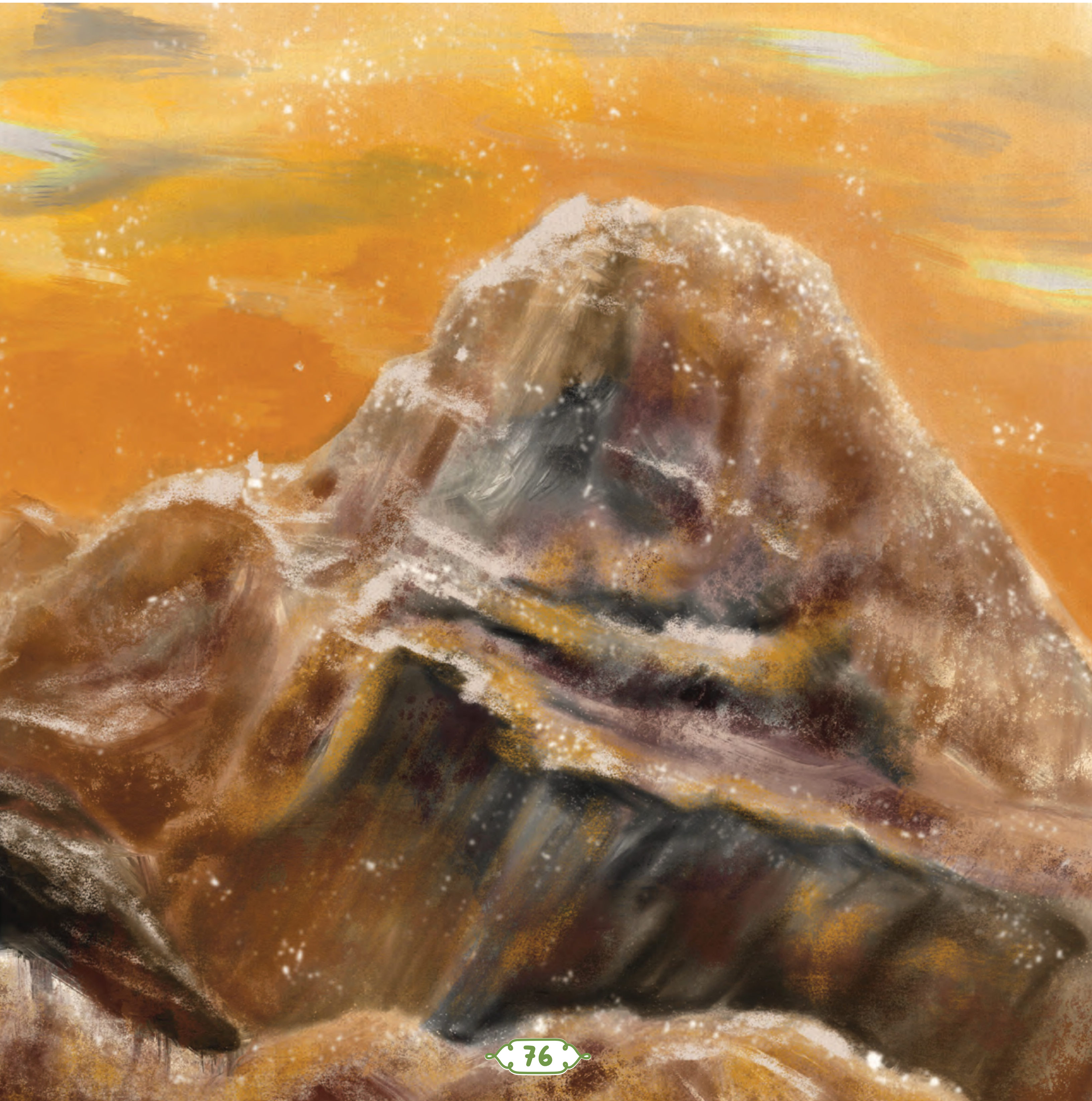
The video makes the audience members feel as if they are soaring over the land like birds flying low across the planet.

"Venus is rocky and has lava and many different types of volcanoes everywhere," Dawn continues. "Most of the volcanoes aren't very tall, and their sides aren't very steep, giving Venus's surface the appearance of rolling hills. One unique type of volcano here is called an arachnoid volcano. It looks a bit like a spiderweb."

"That is so cool," Clark whispers to himself as the spiderweb volcano comes into view. He keeps watching the screen in fascination.



"The largest mountain range on Venus is called Maxwell Montes. Do you see the white areas that look like snow on the tops of the mountains? That's not actually snow at all; it's frost made from metals that boiled, evaporated into the atmosphere, cooled, and settled on the mountains," Dawn explains.

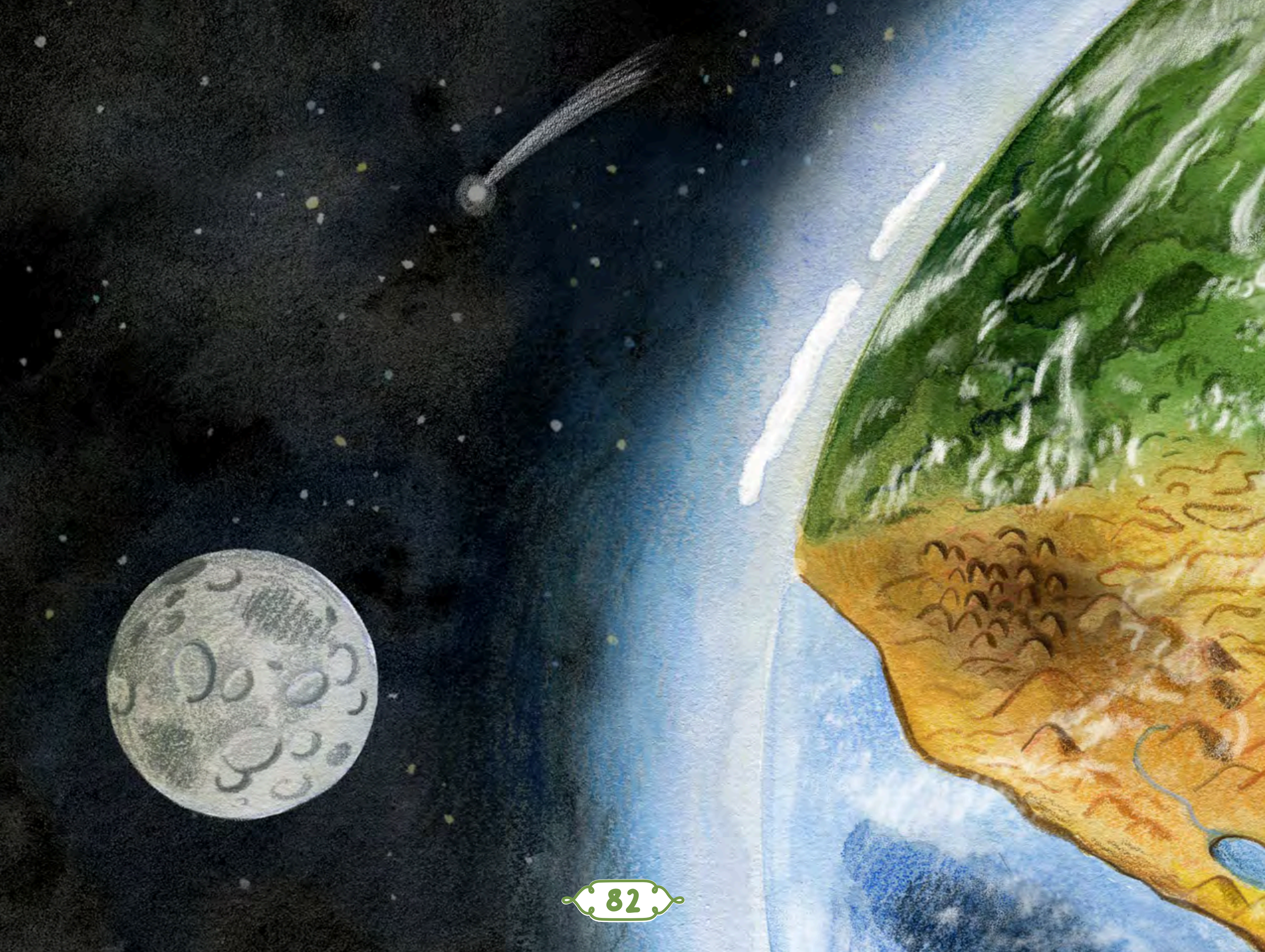


The view of the screen shifts, and the audience is now looking at Venus's sky. It is raining. Dawn continues narrating: "The rain on Venus isn't made of water like ours on Earth—it would actually burn your skin. But don't worry—because Venus is so hot, the rain actually dries up before it hits the surface."

Kevin almost puts his hands up to cover his body before remembering he is still sitting safely in his seat at the planetarium. It all looks so real.

Earth: Our Home

Illustrated by Yana Zybina

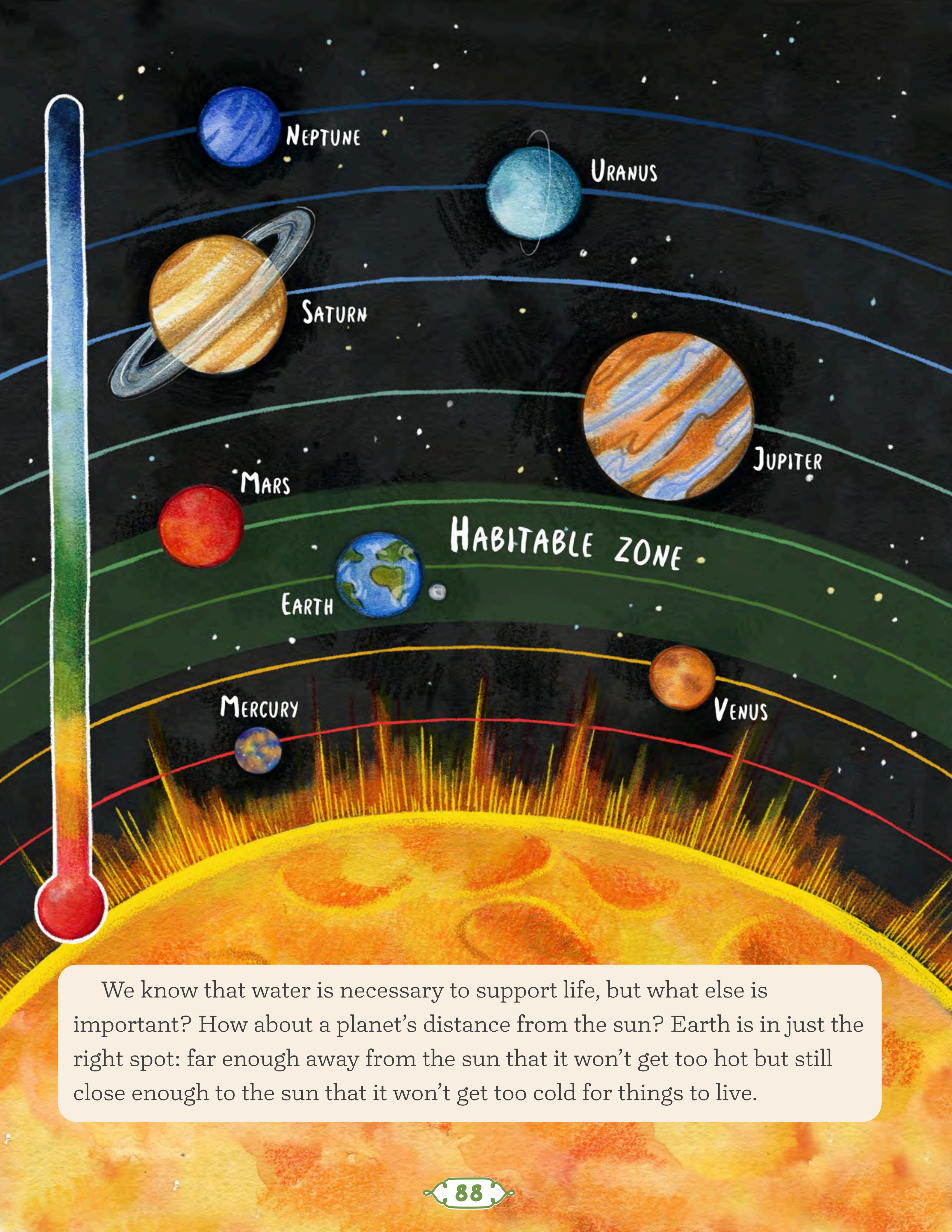


Early one morning as you lie in your warm bed, you open your eyes and look out your window. Peeking above the horizon is a glowing yellow light. The sun is rising, as it does every single day, bringing light and warmth to our home planet—Earth.

God created the earth to be different from all other planets in our solar system. Out of all the planets, Earth is the only one where anything is known to live—but how can this be? How can there be plants and animals, trees and flowers, fish and insects, and even people on Earth but no other planet?

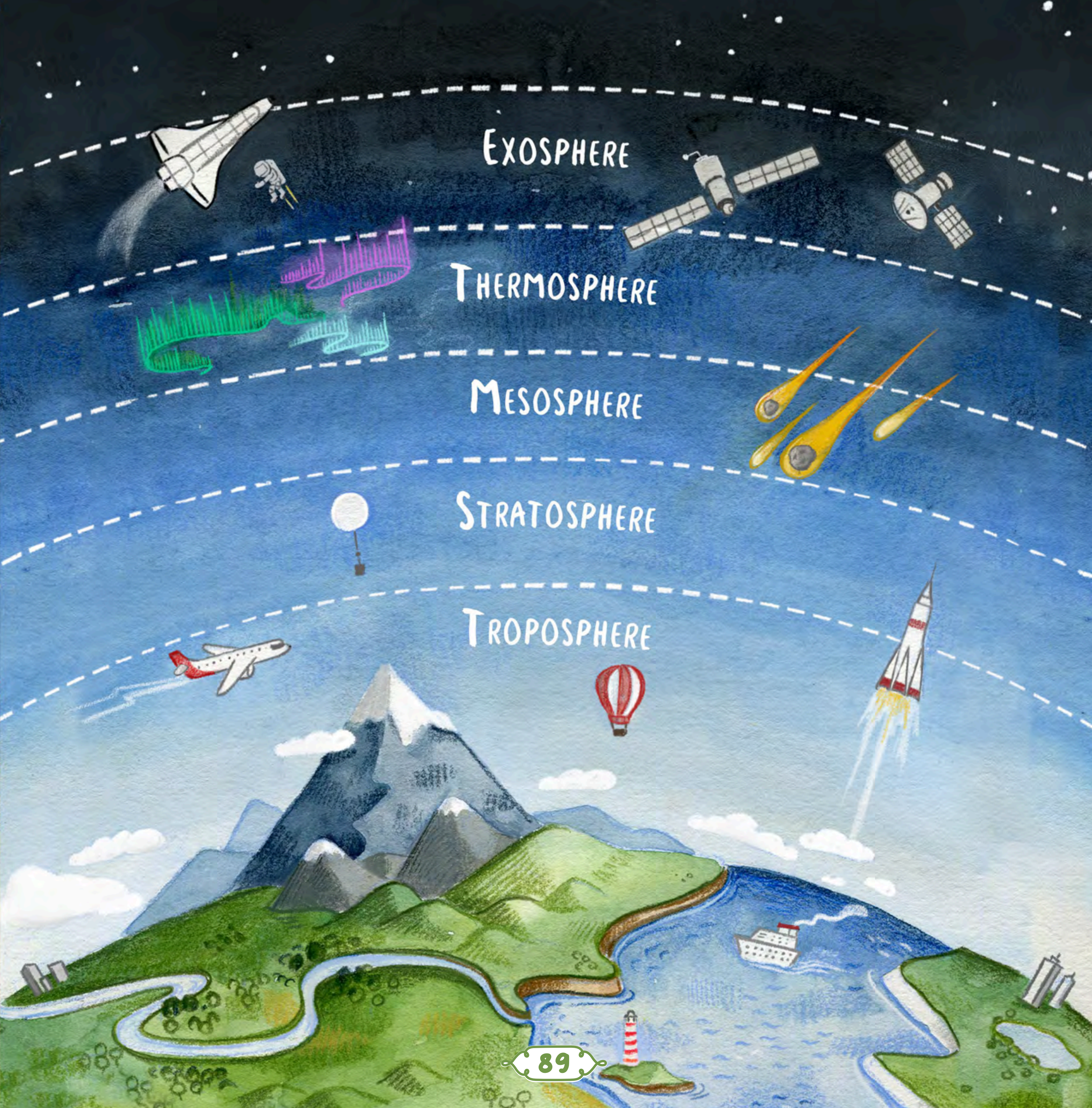
For life to exist on the planet, there needs to be water. The earth's surface is a thin layer of rocky material called the crust. Swirling around on the crust is water. Water provides a home for animals, liquid to drink, and rain for plants to grow. Every single living thing needs water to survive, and because Earth always has a supply of water, life is everywhere on this planet.

What living things are found on Earth? There are so many plants, animals, and humans that it's impossible to observe them all! This is Earth's biodiversity: the combination of all living things on our planet. It may be difficult to believe, but there are animals, plants, and other creatures that haven't been discovered yet!

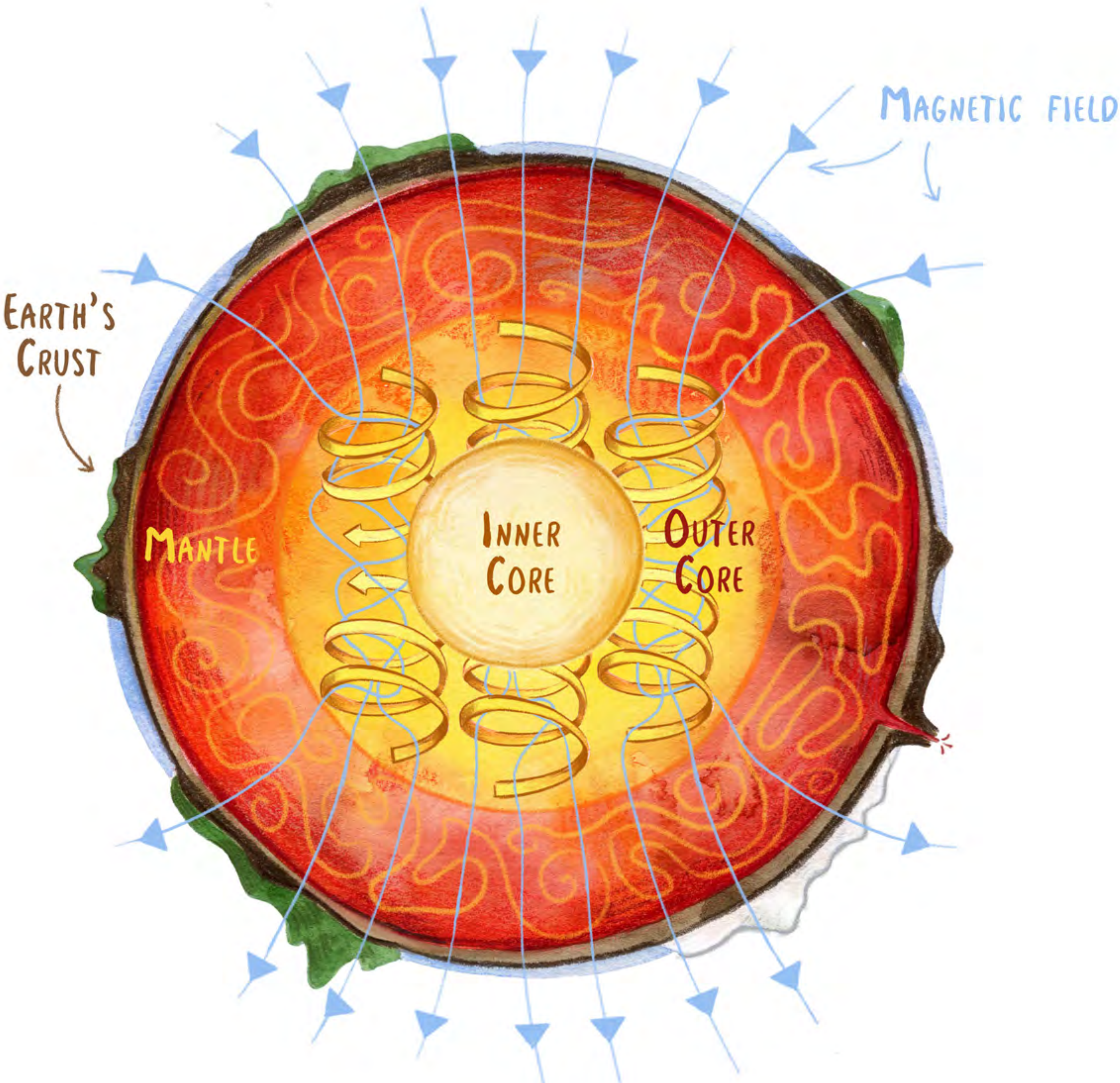


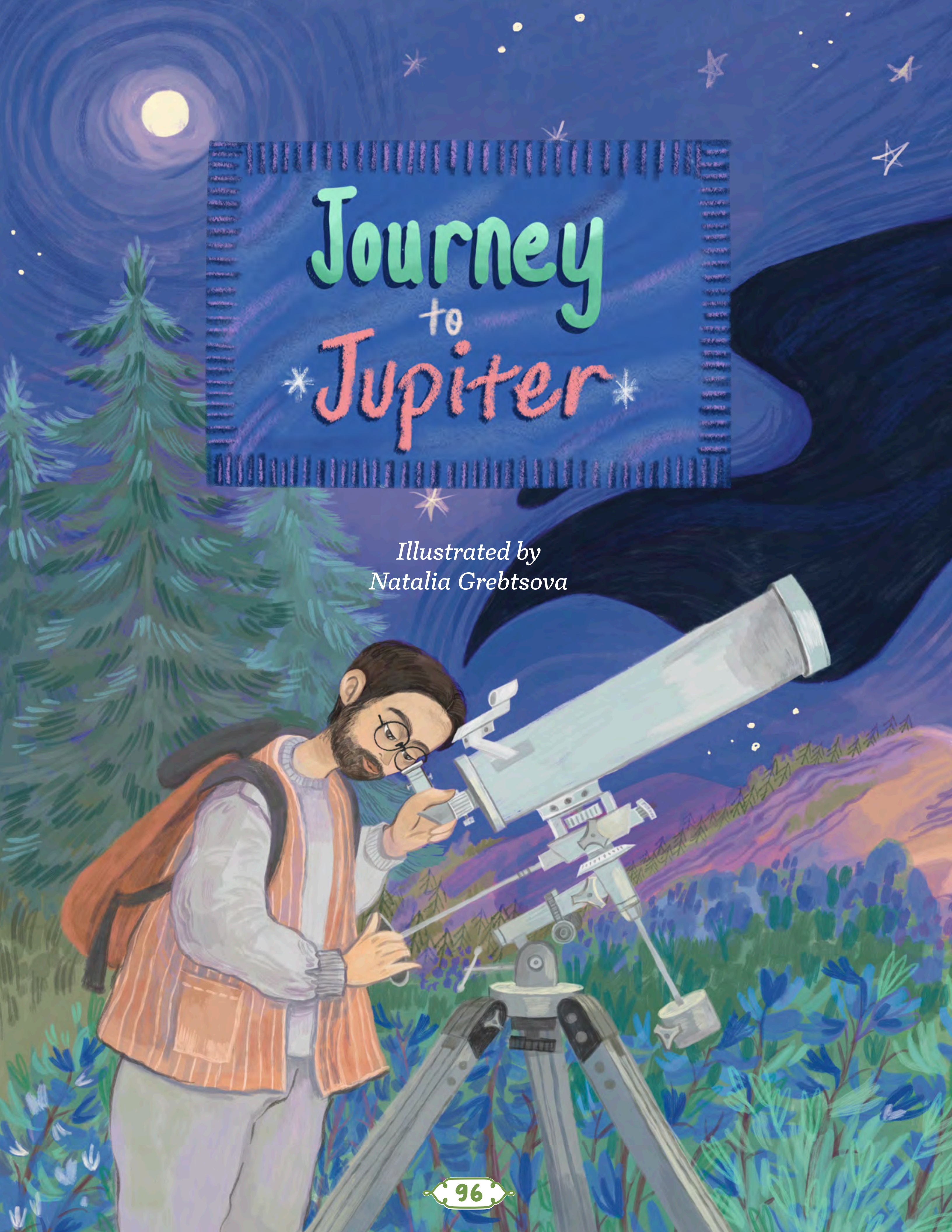
We know that water is necessary to support life, but what else is important? How about a planet's distance from the sun? Earth is in just the right spot: far enough away from the sun that it won't get too hot but still close enough to the sun that it won't get too cold for things to live.

Take a deep breath. What are you actually breathing in? The earth's atmosphere—layers of gases surrounding the earth—has the perfect amount of a gas called oxygen that we need to breathe. This layer of air also helps keep Earth from getting too hot or cold by letting in just the right amount of sunlight.



Another thing that makes life on this planet possible begins deep inside the earth. Under the planet's crusty surface is a thick layer filled with melted rock, or magma, called the mantle. Under the mantle is a layer called the outer core. In the outer core, melted iron swirls around and acts like a magnet, creating an invisible "bubble" surrounding the earth. This bubble, or Earth's magnetic field, protects us from harmful things that come from the sun, such as solar winds and beams of energy called solar rays.





Journey to Jupiter

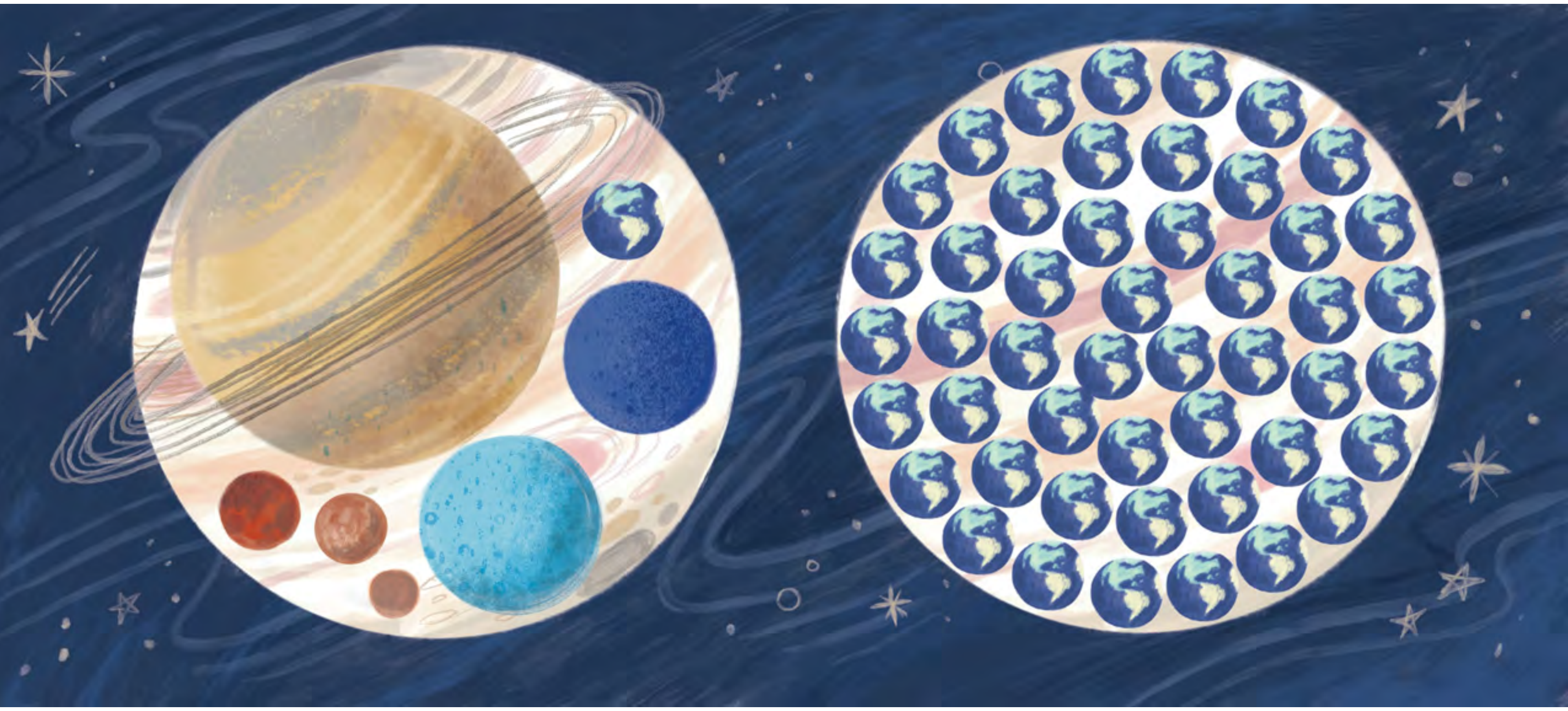
Illustrated by
Natalia Grebtsova

Hello, space explorers! I'm Phillip, a scientist studying objects found in space. I work at the National Aeronautics and Space Administration, which is called NASA for short. I heard you wanted to learn more about the planet Jupiter today. You have come to the right place: I was just studying some data, or information, from our spacecraft that is circling Jupiter right now. I'd love to tell you about it!

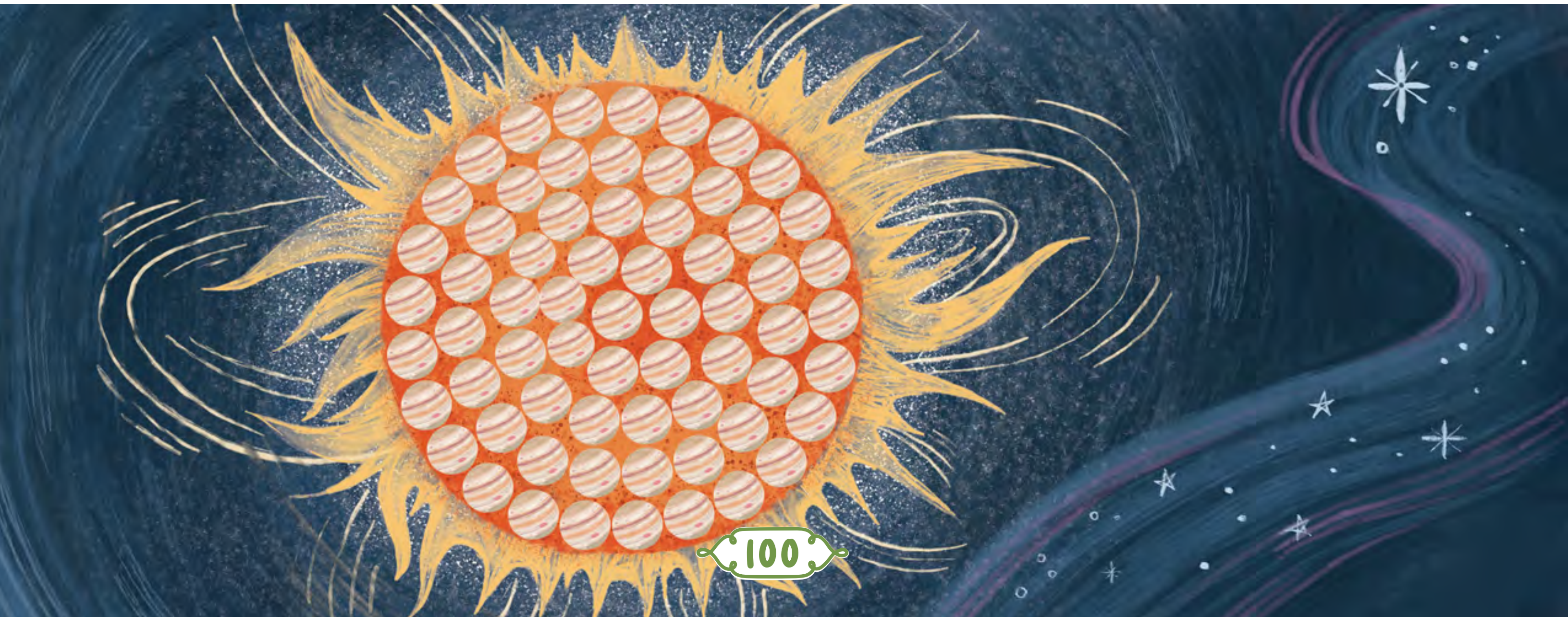
When scientists like me want to learn more about an object in space, we sometimes build a spacecraft that is specially designed to travel safely to that object. *Juno*, the spacecraft we built to explore Jupiter, doesn't have any people on it, but we're hoping it will gather a lot of information so we can learn more about the planet.

Juno took five years to get to Jupiter's orbit! We already knew some information about Jupiter, but right away, *Juno* started taking amazing photos and teaching us new things about the planet. We learn more about what it looks like underneath Jupiter's clouds every day.

So what do we know about Jupiter? Well, Jupiter is the fifth planet from the sun, and it is massive! We could take all the other planets in the solar system and fit them inside Jupiter without a problem. Or we could fit more than 1,000 Earths inside Jupiter; it is that large!



Now, you might be wondering—if it is that big, is it bigger than the sun? It is not. We could fit about 1,000 Jupiters inside the sun. I don't know about you, but I think that is getting too huge to imagine. Let's just say Jupiter is really big, but the sun is still bigger.



Jupiter is also really beautiful. The twists and spirals of the gases on its surface blend together in a splash of colors. Look at all of those swirls. Do any of them stand out to you? Whenever I look at Jupiter, my eyes go straight to the giant red spot on one side.

That fascinating spot is a giant storm that has been on the planet for at least 150 years. When Earth has storms, big gray clouds gather in the sky and then fade away when the storm ends, usually after only a few hours or days. The storm on Jupiter is slowly shrinking, but it is still bigger than the size of planet Earth and won't stop anytime soon.

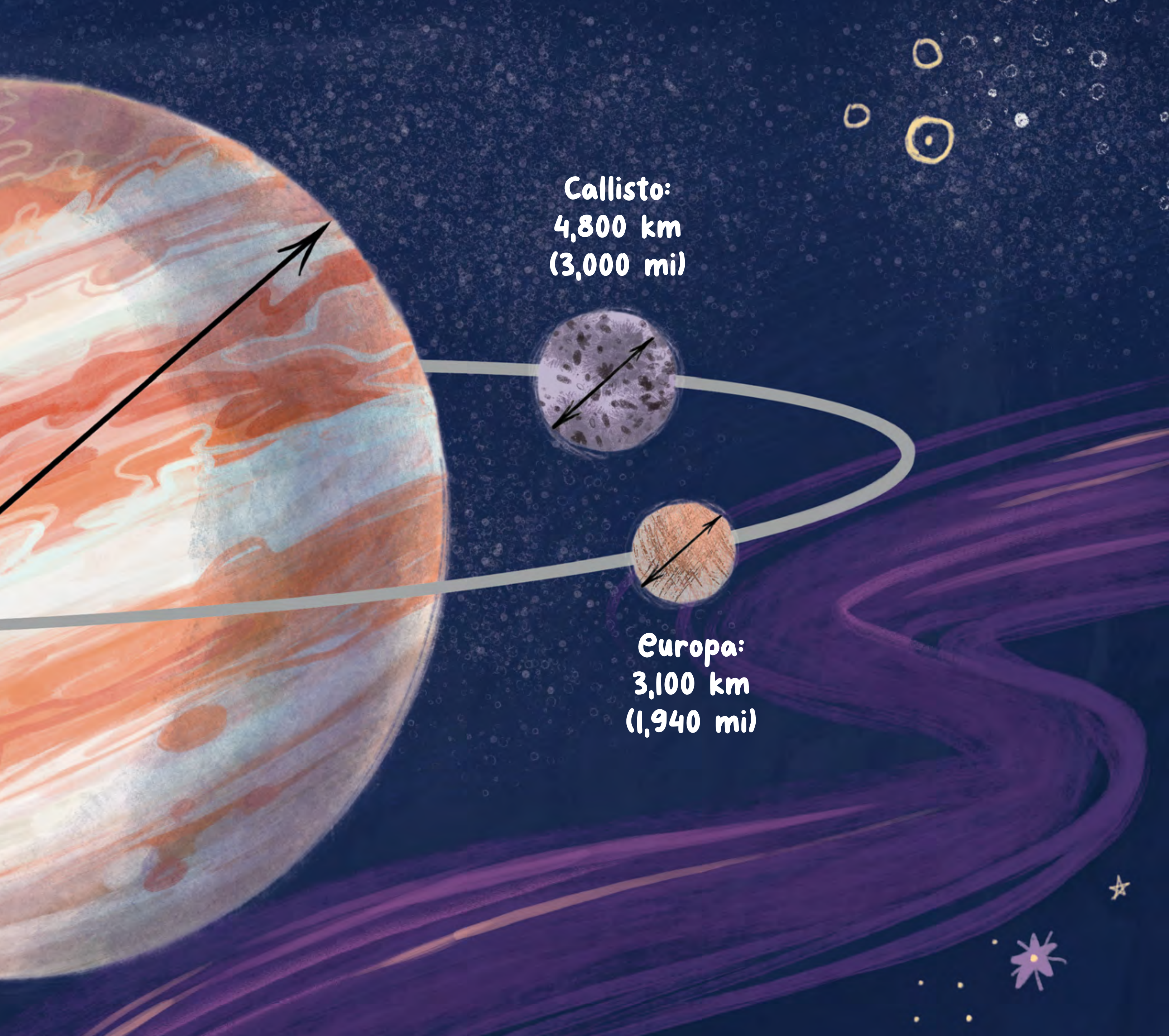
Can you imagine a storm bigger than our entire planet? And that storm lasting for more than your entire life? That would be a pretty wild storm!

You might have guessed that nothing could live on a planet with a storm that big, and you are correct. But even if something wanted to live on Jupiter, it wouldn't have a place to land—there is no surface!

Our spacecraft, *Juno*, has showed us that the center of Jupiter is probably not the same as Earth's. Scientists aren't sure whether it's solid or made of a thick, extremely hot liquid. It kind of looks like a ball, but not a solid one. Jupiter's loose and fuzzy core takes up half the diameter, or size, of the planet.

Have you heard the word "diameter" before? Objects shaped like balls or planets have diameters. The diameter is how far across the round object is if we go straight through the middle—like if we drove a car through the center of Earth! We often measure planets using their diameters.

Earth and Jupiter are very different sizes. If Earth were the size of a nickel, Jupiter would be the size of a basketball! Which one do you think has the bigger diameter? You're right—Jupiter. We can also use diameters to measure the sizes of Jupiter's 80 moons. Here are the diameters of a few of them. Can you find the moon with the biggest diameter? You're right: It is Ganymede [GAN–eh–mede]. Ganymede is actually the largest moon in our solar system.



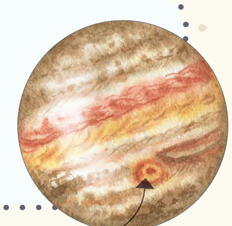
What else is interesting about Jupiter? Oh, here's a good fact: Jupiter is like a vacuum cleaner for the solar system. Because Jupiter is the biggest planet in the solar system, it has the most gravitational force. Sometimes, Jupiter's gravity pulls in comets and asteroids that might have been on a path to hit Earth. Other times, Jupiter's gravity causes these big space rocks and ice balls to slingshot, or veer away, from the planets altogether and head back out into space.

Well, thanks for stopping by NASA today. I have a lot more research I need to get back to. There are so many new things to learn about space, and I get to be one of the first people to discover them. I have a wonderful job! Come back anytime if you want to learn more about Jupiter. The only thing I love as much as learning about space is sharing what I learn with others.

FUN FACTS ABOUT JUPITER

Because Jupiter spins so fast, its shape has flattened out a bit. Now, it bulges at its equator and is not a perfectly round sphere like a baseball.

There are lots of facts about space that we have yet to discover. For example, we still aren't quite sure why Jupiter's large spot is the color red.



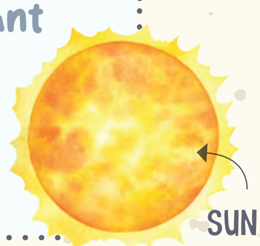
JUPITER'S RED SPOT

Jupiter was named by a group of people called the Romans a long time ago. They also named Mercury, Saturn, Venus, and Mars.

When a scientist named Galileo Galilei saw Jupiter with a telescope over 400 years ago, he saw four of Jupiter's moons orbiting around it. This was really important at the time because most people believed that Earth was the center of the universe and everything in space revolved around the earth. Galileo's discovery made people question if that was really true.

We measure the length of a year based on how long it takes for a planet to go around the sun. It takes Earth about 365 days to complete the journey, which is what we call one year here on Earth. It takes Jupiter about 4,333 of our days to go around the sun, so one year on Jupiter is more than 11 years on Earth.

Jupiter is often called a gas giant because it is a giant planet made up of gas. The two main kinds of gases on Jupiter are helium and hydrogen, which are the same gases that we find in the sun.



Jupiter has rings. They are very thin and faint, and they are not easy to see, even with a telescope.

Cosmic Snowballs

Illustrated by
McKenzie Rose West

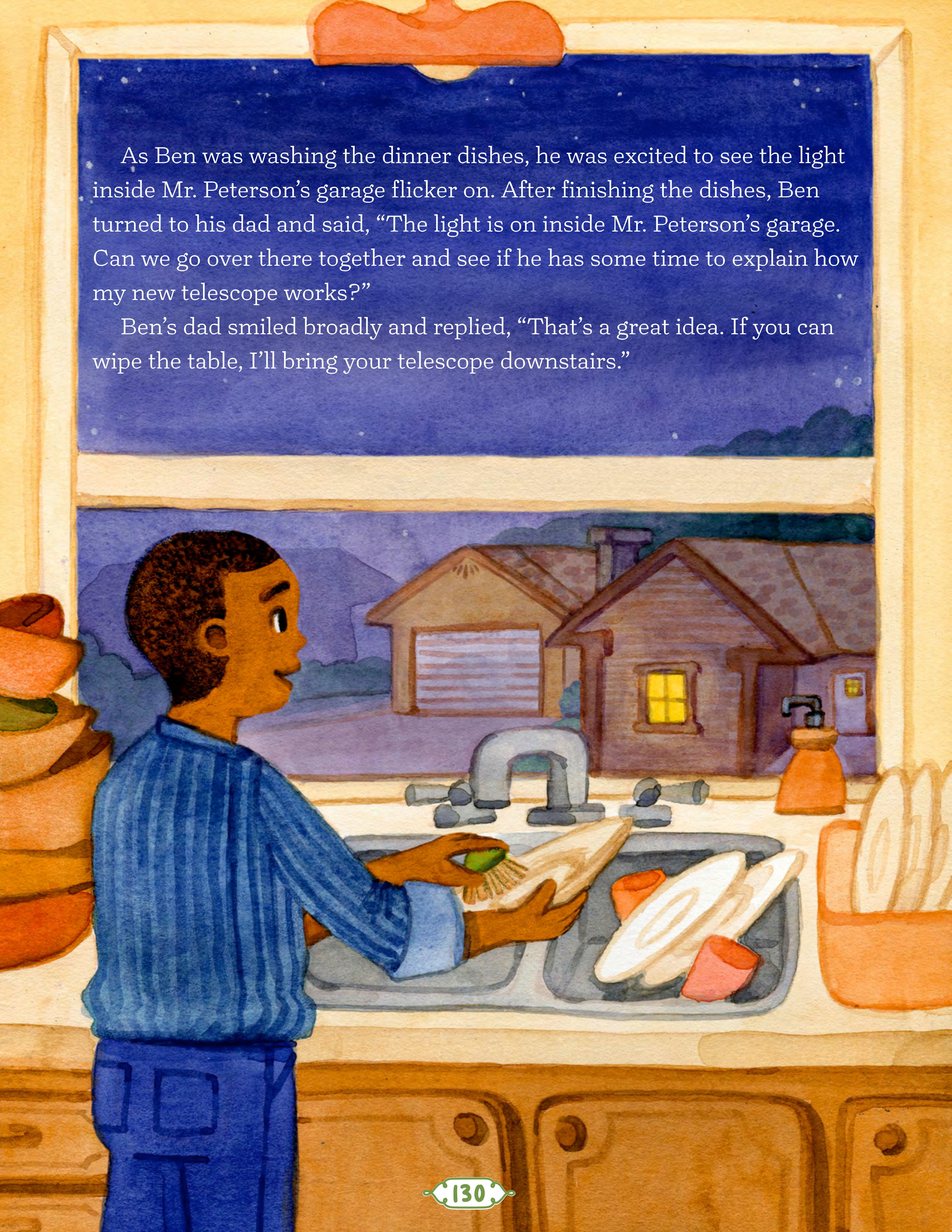
Ben closed the front door and shouted, "I'm home, Mom!"

He sprinted up the stairs two at a time and flung open his bedroom door. It was the day after his 10th birthday, and he had spent a lot of time thinking about the gifts he had received. The gift he was most excited about was the telescope his neighbor Mr. Peterson had given him.

Mr. Peterson was a retired high school science teacher who loved sharing his vast scientific knowledge with Ben. The telescope had caught Ben's eye every time he joined Mr. Peterson in his garage to talk about tropical fish, flowering plants, or Ben's favorite topic, astronomy. The telescope wasn't new or shiny, and it squeaked loudly when it swiveled on its base, but it was definitely his favorite birthday present.

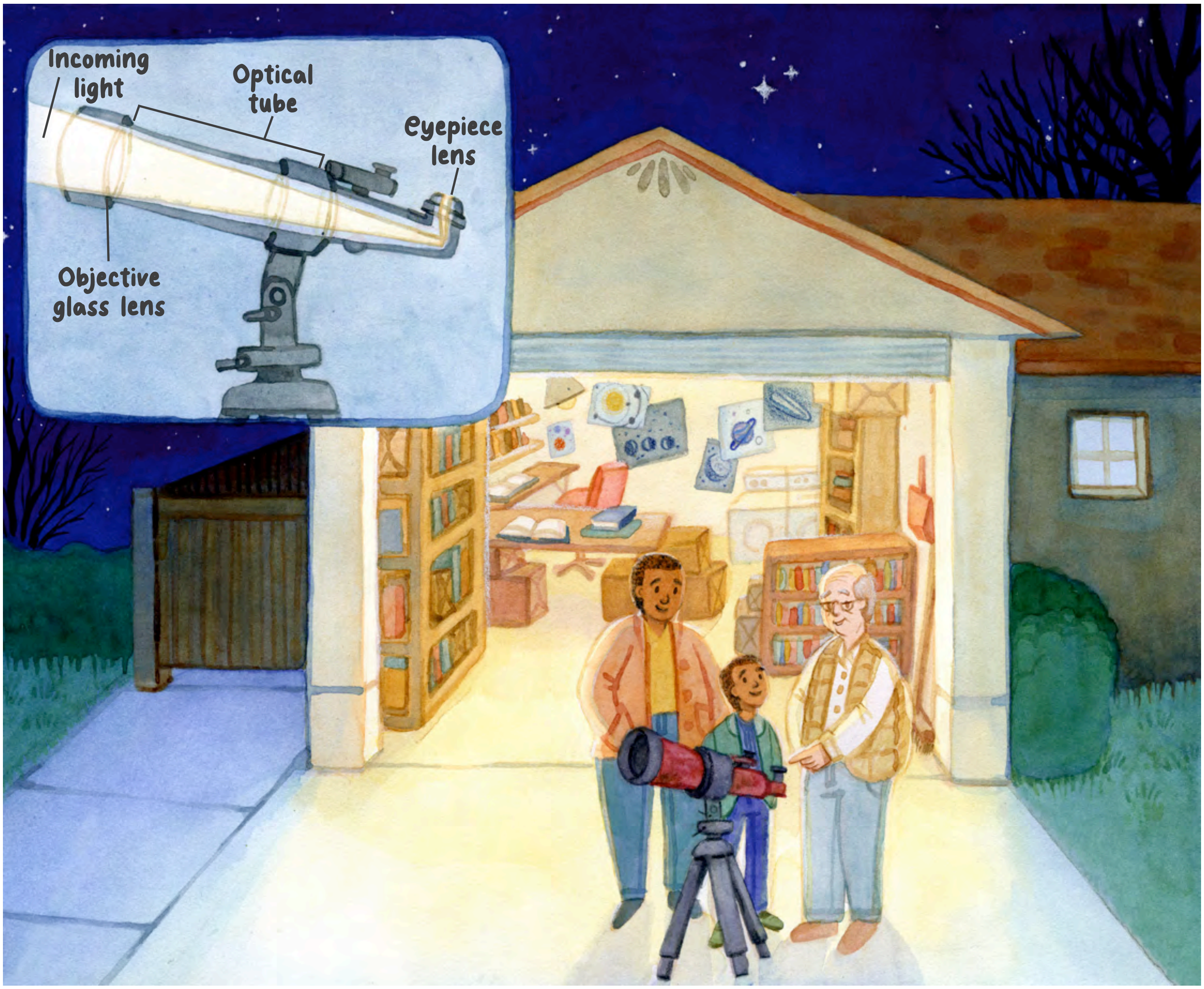
As Ben was washing the dinner dishes, he was excited to see the light inside Mr. Peterson's garage flicker on. After finishing the dishes, Ben turned to his dad and said, "The light is on inside Mr. Peterson's garage. Can we go over there together and see if he has some time to explain how my new telescope works?"

Ben's dad smiled broadly and replied, "That's a great idea. If you can wipe the table, I'll bring your telescope downstairs."



Mr. Peterson peered out from his garage and spied Ben and his dad walking toward him. "Is that the birthday boy I see?"

"It is!" Ben exclaimed. "Mr. Peterson, I was wondering if you have time to show me how my new telescope works."



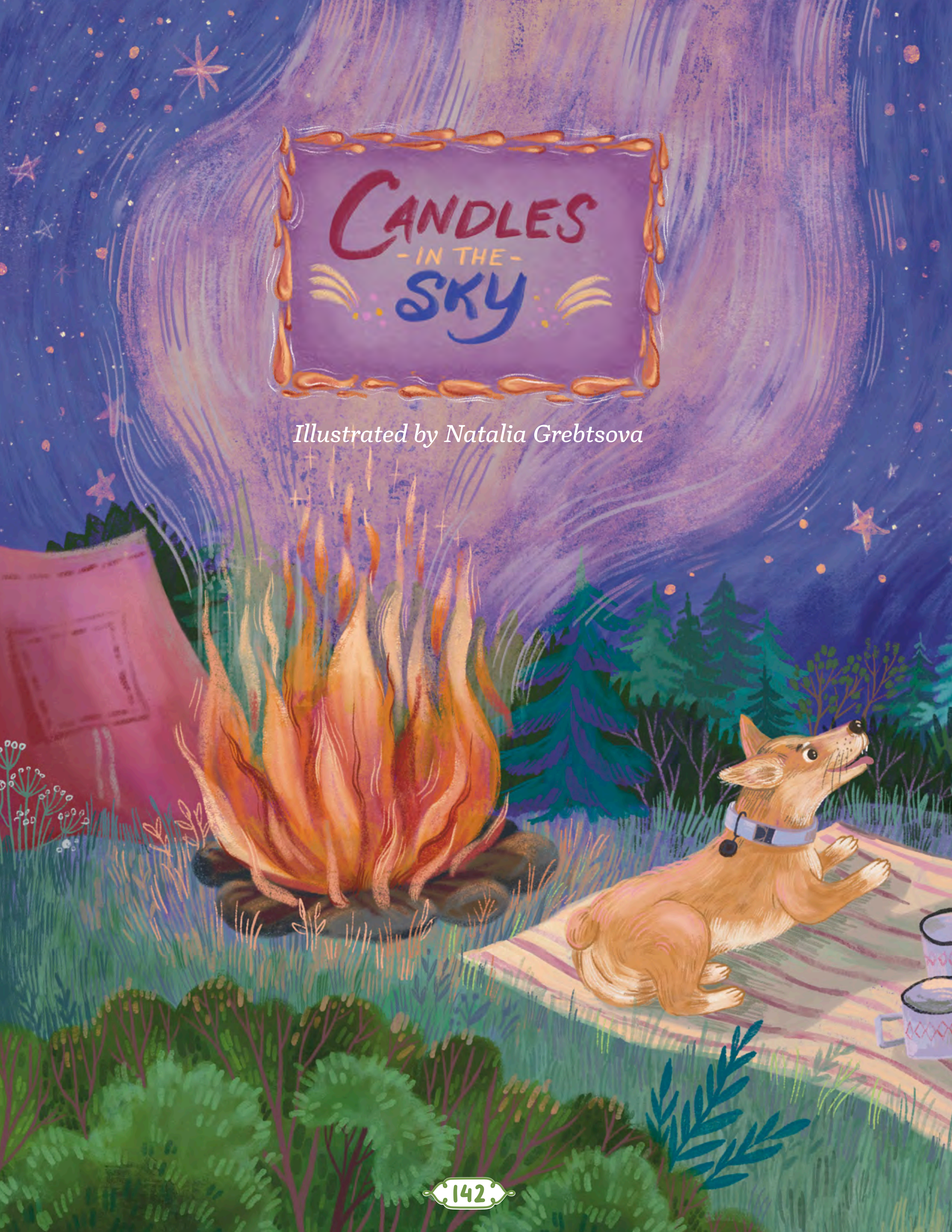
"Absolutely! This is a refracting telescope, which uses a curved piece of glass at one end to collect and bend light from faraway objects. Then the light travels down the rest of the telescope tube to this eyepiece. That's the part you look into, and it makes the object look even bigger. Newer reflecting telescopes use mirrors, which weigh a lot less and are cheaper to make, instead of glass lenses," Mr. Peterson told Ben.

Mr. Peterson opened the book to one of the first pages and said, "This diagram shows us a picture of some famous comets. It explains that comets are made up of the 'leftover' materials from when God created the solar system. Some of the rocks, dust, and ice that were not used to make stars, planets, or moons became comets." Dad and Ben crowded around the book to look.

“Here is a picture of the different parts of a comet,” Mr. Peterson said, pointing to the book. “A comet’s nucleus is a frozen round ball of rock, dust, and ice loosely held together. A nucleus may sound small, but the nucleus of a comet can be the size of a small town! Around the nucleus is the coma [COH-muh], which is made of gases. This is the part we can see best from the telescope.”

Candles in the Sky

Illustrated by Natalia Grebtsova



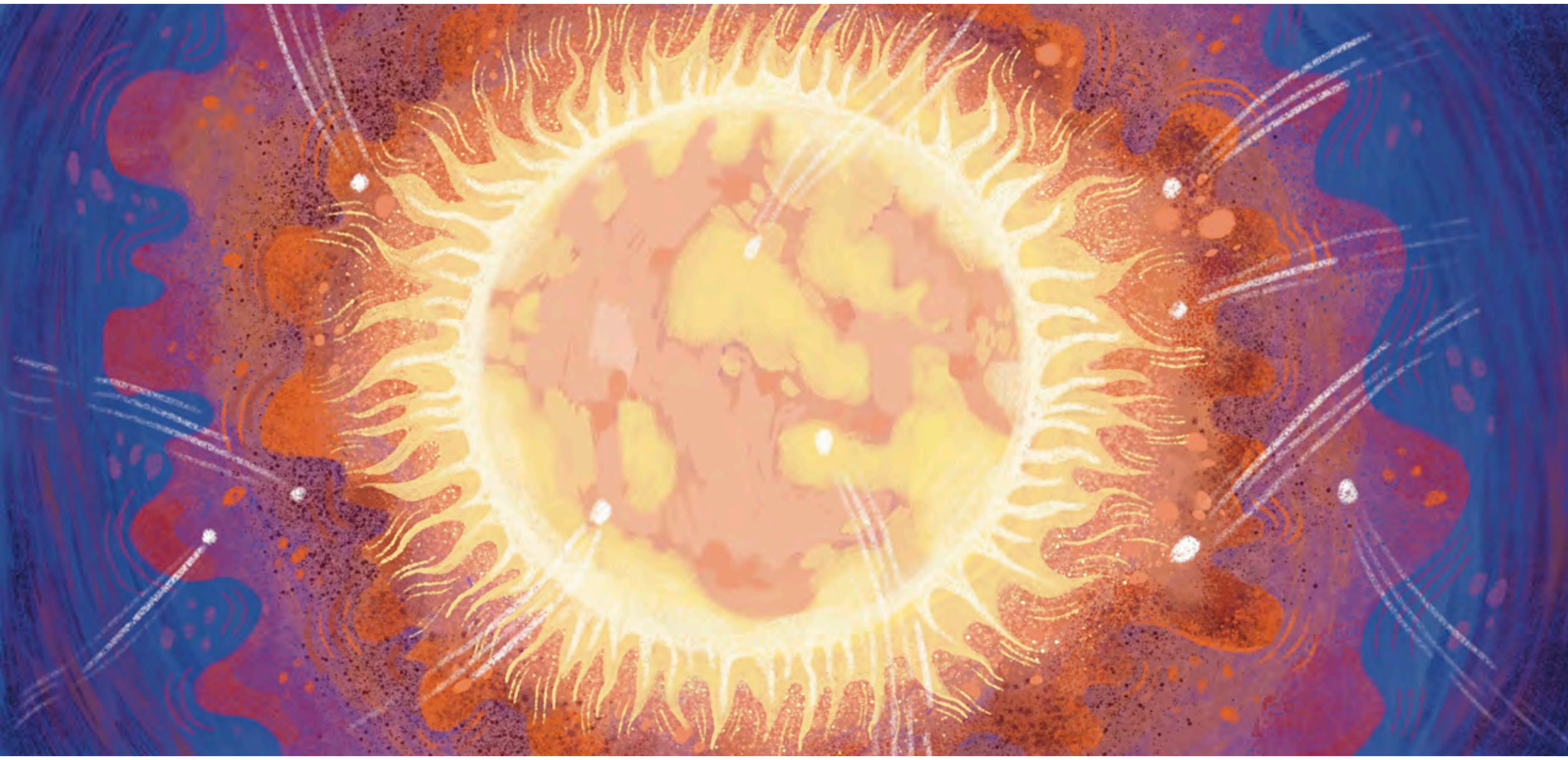
Look up in the sky on an inky-black night and notice the thousands of twinkling lights. You can almost imagine a massive city up there with little candles burning in every window.

With a simple command, God created stars to shine light and warmth on the planets, to guide ships and weary travelers safely home, and to dazzle us with their sheer number and beauty.

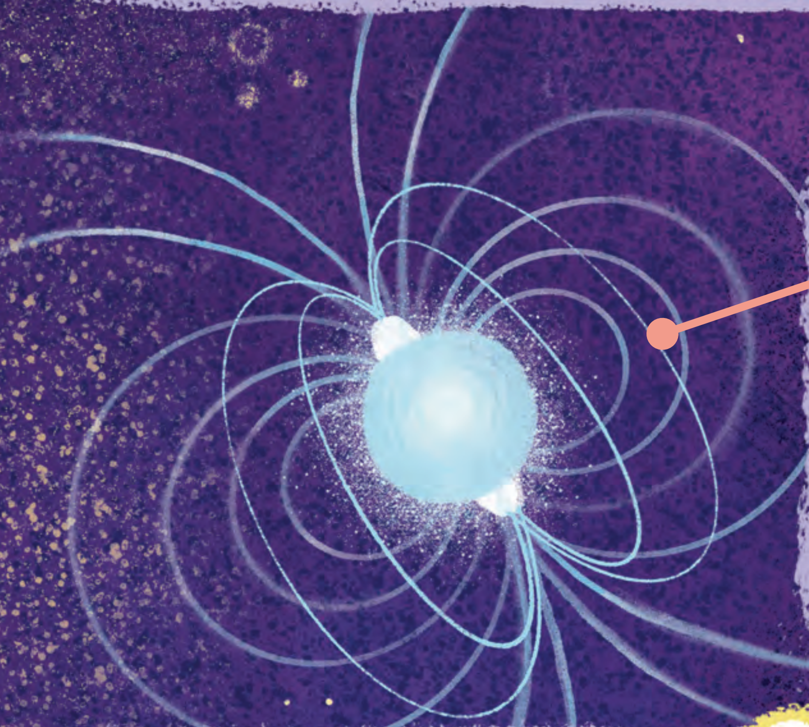
The closest star to Earth, called Sol [SAHL], is our sun—but it is still very far away! Its glow keeps our earth warm, and its light helps trees and plants grow. There are an uncountable number of stars in the universe, which includes everything in space. We think a lot of the stars have solar systems revolving around them in a way similar to ours.

You might have seen stars in picture books that look like these:

But did you know that a star is actually a ball of burning gas?



At any time, stars are being born and are dying. Gazing up in the night sky, you can see so many stars in all different phases of life. How can people make sense of the countless stars they're seeing?



8

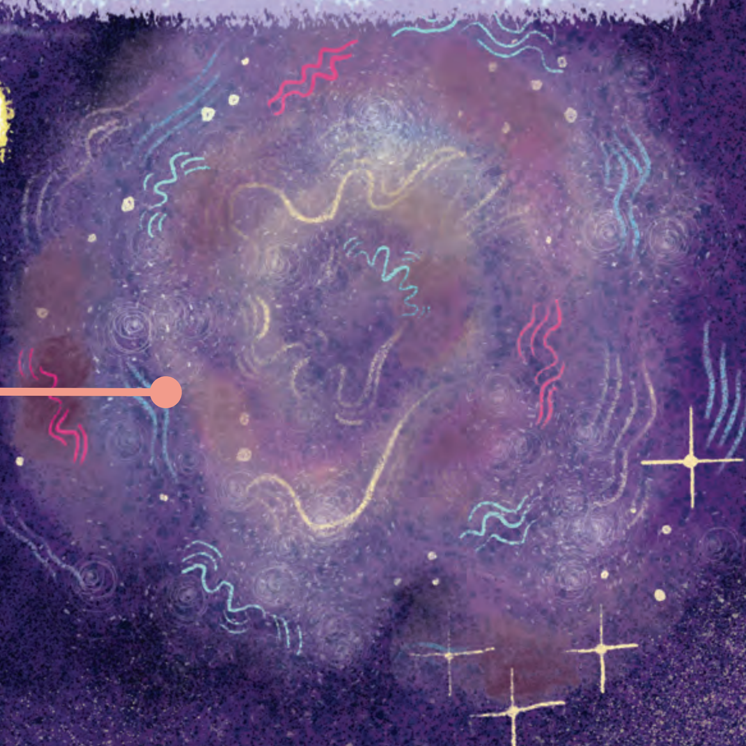
Neutron Star

After exploding in a supernova, some white dwarf stars collapse even more into an object called a neutron star.

7

Supernova

Instead of gently cooling and dying out, bigger stars lose the fight with gravity and explode in a spectacular event called a supernova.



Look at this beautiful sky lit with stars. Can you connect the star "dots" to form a shape or simple picture? Since the beginning of time, humans have studied the stars in the night sky. Many years ago, as people gazed up, they saw pictures formed by the stars, and they named the pictures after animals and heroes from their cultures. These are called constellations.

Signing about Solar

Illustrated by Bojana Stojanovic

USA & CANADA

Many deaf people in the United States and Canada use American Sign Language. This language uses hands, facial cues, and body language to communicate since most of its users cannot hear some or any sounds.

Here are a few signs that are used in this story. See if you can find the characters using them in the pictures.

It was a typical Saturday morning in the summer. I was playing games with my little brother, Jackson, when I heard a sound outside and looked up.

Jackson signed "What?" in American Sign Language. My brother and dad are both deaf and don't hear sounds.

I signed back, "I heard something. Let's go look." We both got up and hurried over to the window. A van with a picture of the sun on the side was in front of our house, and several men were unloading big rectangular boxes.

From Seed to Harvest

Illustrated by Shannon Vogus

Hi! My name is Felix, and this is my farm. Here in the state of Illinois, in the United States, we grow a lot of sweet corn. Have you ever wondered where the corn on your plate comes from? Well, today I am going to show you how corn goes from a kernel, or tiny seed, to the delicious corn you eat for dinner!

One of my favorite things about being a farmer is using the large, loud farm machines that help me grow and take care of the corn! A long time ago, farmers pulled their planters and carts using their own strength or teams of animals, such as horses.

The machine I use the most is a tractor: a very large, powerful vehicle made to replace those animals and make a farmer's work much easier. My big green tractor carries me all over the farm. It has two very tall wheels in the back and two smaller ones in the front. My tractor can pull things that would need 200 horses to pull! It also pulls several smaller machines that help me grow lots of corn.

FUN FACTS ABOUT FARM MACHiNES

The juicy sweet corn you eat is different from the hard field corn eaten by farm animals or made into other products, such as cornstarch, corn oil, corn syrup, and even ethanol fuel.

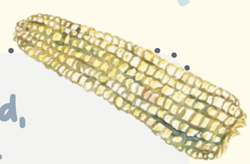
The word "tractor" comes from the Latin word *trahere*, which means "to pull."

There are approximately 4.2 million tractors on farms and ranches in the United States.

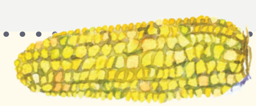
Farm machines started using fuel-powered engines in the early 1900s. Many companies told people these machines were "better and cheaper than horses" to convince them to buy tractors.

Early harvesting machines were called threshers and were powered by steam.

Farmers grow corn on every continent except Antarctica.



Corn isn't always yellow. It can be green, blue, red, or white. Cobs always have even numbers of rows.



The world's tallest cornstalk ever recorded was more than 14 m (45 ft) tall.