Bluebonnet Learning
K–5 Reading Language Arts

ENGLISH

WHAT'S IN OUR UNIVERSE?



GRADE 3 UNIT 6 | READER

EDITION 1

Grade 3 | Unit 6

What's in Our Universe?

Reader

Acknowledgement:

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Table of Contents

What's in Our Universe?

Unit 6 Reader

Chapter 1: The Sun, Earth, and Our Solar System 1

Chapter 2: The Moon 7

Chapter 3: The Planets Closest to the Sun:
Mercury, Venus, Earth, and Mars 13

Chapter 4: The Outer Planets:
Jupiter, Saturn, Uranus, and Neptune 21

Chapter 5: Asteroids, Comets, and Meteors 27

Chapter 6: Galaxies and Stars 33

Chapter 7: Constellations 41

Chapter 8: Exploring Space 49

Chapter 9: A Walk on the Moon 57

Chapter 10: What's It Like in Space? 65

Chapter 11: The Space Shuttle 71

Chapter 12: Dr. Mae Jemison 77

Chapter 13: The International Space Station 85

Pausing Point (Additional Chapters for Enrichment)

Chapter 14: Nicolaus Copernicus. 90

Glossary for *What's in Our Universe?* 97

Chapter 1

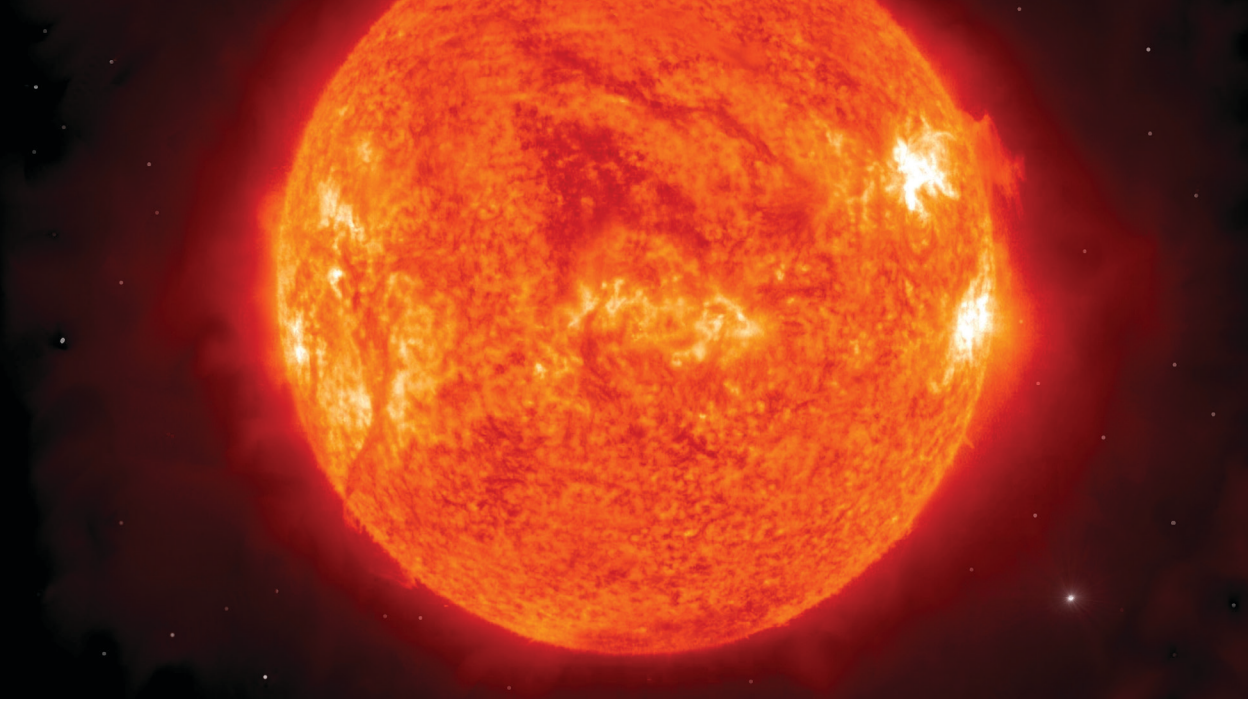
The Sun, Earth, and Our Solar System

Look up in the sky at noon. What do you see? If it is not cloudy, you will see the sun shining brightly in the sky.

The sun provides energy—both light and heat. The sun's light and heat give life to plants and animals. Without the sun, Earth would be freezing cold. Have you ever wondered what the sun is made of or why it gives off so much light and heat?



The sun gives us light and heat.



A close-up of the sun

You may be surprised to know that the sun is a star. It is in fact the closest star to Earth. It is made up of different, hot gases. How hot? A hot summer day on Earth is 100 degrees. On the sun, it is 10,000 degrees! The sun stays that hot all the time! The sun's gases create the light and heat it gives off.

Long ago, people thought that the sun moved around Earth. This seemed to make sense. Each morning at the start of the day, the sun rose in the east. At the end of the day, the sun set in the west—exactly opposite from where it had come up. To explain this change, people said the sun moved around Earth. But now we know that this is not what really happens. The sun does not move around Earth. It is Earth that moves around the sun!

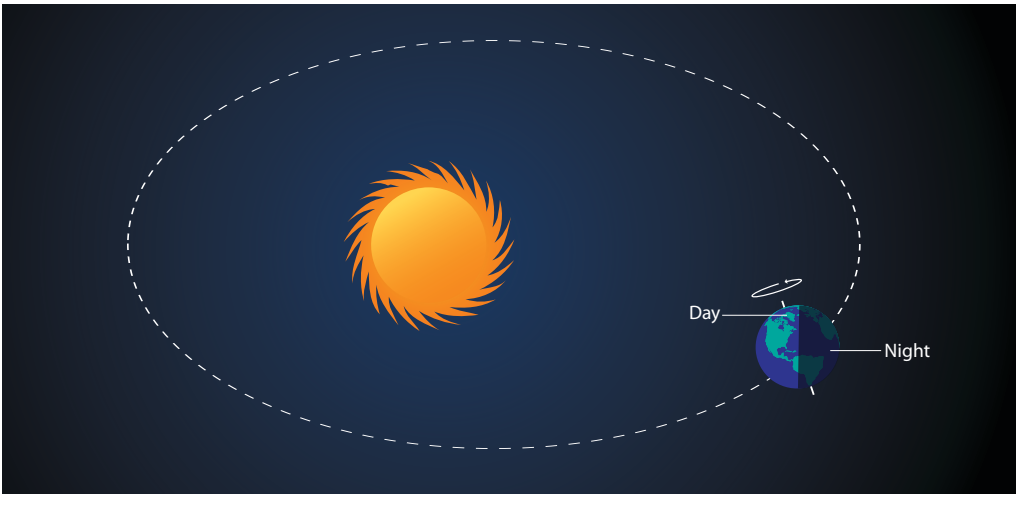
The sun is in the center of a group of eight **planets**. All of these **planets**, including Earth, circle, or **orbit**, around the sun. The sun, **planets**, and other objects in space that **orbit** the sun are called the **solar system**. The word *solar* has the Latin root word *sol*, which means "the sun." Everything in the **solar system** relates to the sun.



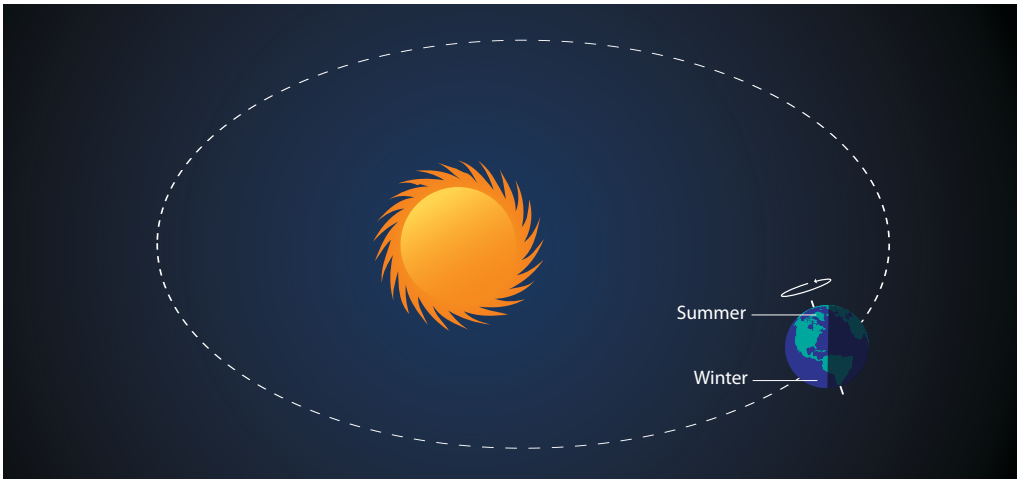
***Planets orbiting** the sun*

Our **planet**, Earth, moves in two ways. We have just learned that Earth circles, or revolves, around the sun. It takes about 365 days, which is one year, for Earth to **orbit**, or revolve, around the sun.

Earth also moves by spinning, or **rotating**, on its **axis**. It is this spinning that makes day and night on Earth and the motion of the sun across the sky from sunrise to sunset. It takes one day for Earth to make one complete **rotation** on its **axis**. As Earth **rotates** and spins, different parts of it face the sun. When the part facing the sun gets sunlight, it is daytime on that side of Earth. The part that faces away from the sun gets no sunlight. So, on that side of Earth, it is nighttime. Did you know that when it is daytime where we live, it is nighttime on the other side of Earth?



*Earth spins on its **axis**. On the side of Earth facing the sun, it is daytime. On the side facing away from the sun, it is nighttime.*



*When Earth is **tilted** on its **axis** towards the sun, it is spring and summer. When Earth is **tilted** on its **axis** away from the sun, it is fall and winter.*

When Earth **rotates** on its **axis**, it is **tilted**. At certain times of the year, one part of Earth is **tilted** toward the sun. The sunlight is more direct and it feels hotter. For people living on this part of Earth, it is summer. For people living on the part of Earth **tilted** away from the sun, there is less sunlight and it is winter. So, when it is summertime for us, there are people living on other parts of Earth where it is winter! So, the fact that Earth is **tilted** on its **axis** is what creates the seasons of the year.

Chapter

2 The Moon

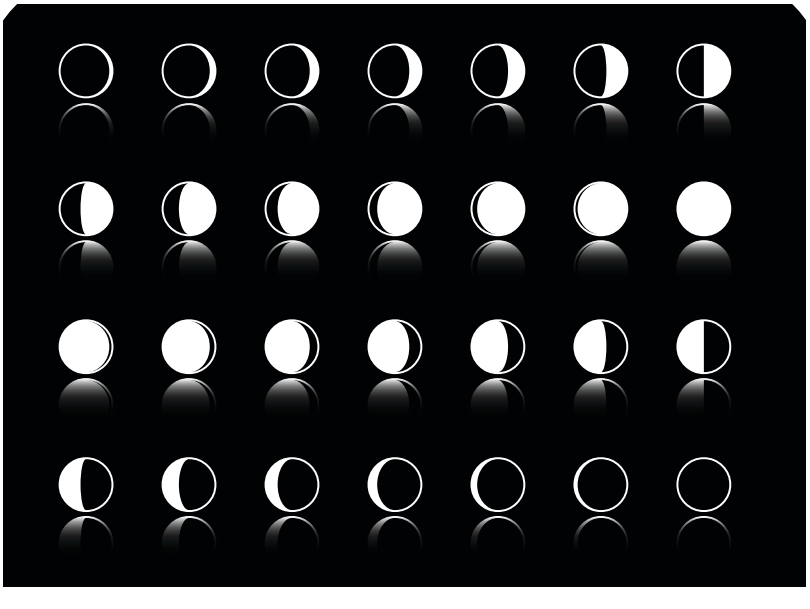
Look up in the sky at night. What do you see? If it is not cloudy, you may be able to see the moon.

When you see the moon at night, it might look white. It might look gray or silver. Sometimes, it seems to shine and glow. But the moon does not give off light the way the sun does. The moon is a ball of rock that gives off no light of its own. It simply reflects light from the sun. That means light from the sun hits the moon and bounces off.



Our moon is easily visible on most clear nights.

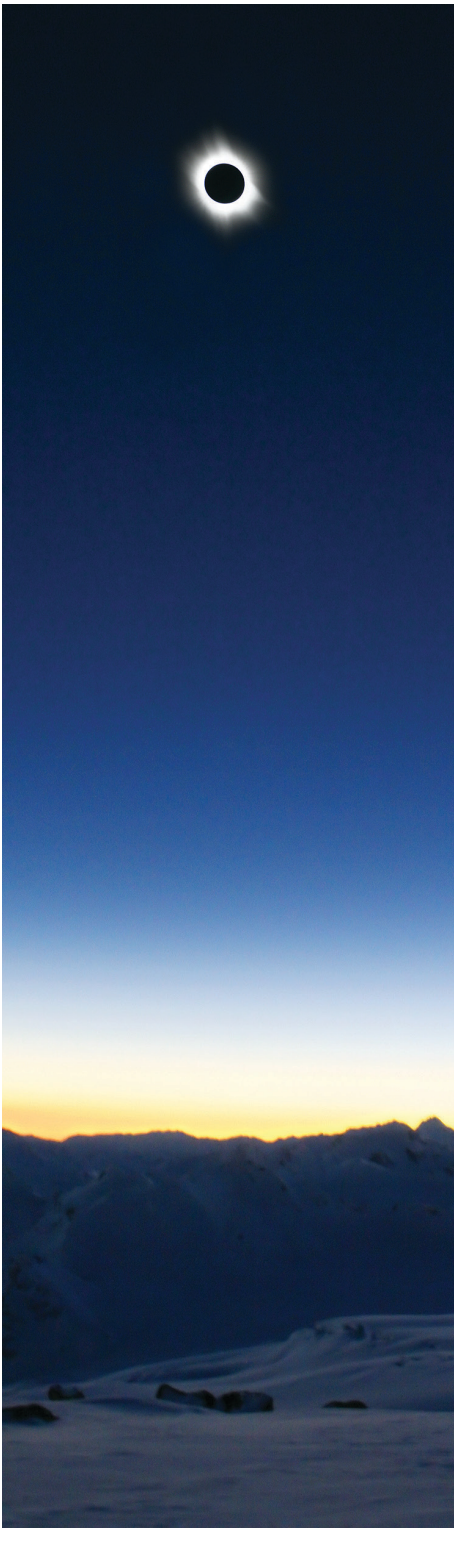
You already know that Earth **orbits** around the sun. But did you know that the moon **orbits** around Earth? It takes just about one month for the moon to completely circle Earth. If you look up at the night sky each night of the month, you may think that the size and shape of the moon is changing. However, the size and shape are not really changing. The moon is still a round ball. It looks different at different times of the month because of the way the light from the sun is reflected and how much of the moon we can see from Earth.



This chart shows the phases of the moon. It shows what you might see if you looked at the moon each night for a month. You can read the chart just like you would read a book. Start at the top and go from left to right. When you finish reading the first row, go on to the next one. You can see how the moon seems to change during the month.

The way that Earth, the moon, and the sun move can also make other interesting things to look at in the sky. When Earth, the moon, and the sun all move together in a direct line, something called an **eclipse** can take place.

We can see two kinds of **eclipses** from Earth. One kind happens when the moon gets in between the sun and Earth. When that happens, we can't see the sun for a while. At least, we can't see part of it. We call this a solar **eclipse** or an **eclipse** of the sun.



*During an **eclipse** of the sun, the moon moves between Earth and sun and blocks out the sun.*

The other kind of **eclipse**, called a lunar **eclipse**, also involves the sun, the moon, and Earth. It takes place when the moon passes behind Earth and into its shadow. In the image on the next page, you can see that a shadow covers part of the moon. It is Earth's shadow that you see. Earth has blocked out the sun and left part of the moon in darkness.

Eclipses do not happen often because the sun, Earth, and the moon all have to line up just right. Solar **eclipses** can only be seen from a narrow strip of Earth at a time. While they happen once or twice a year, it is very, very rare to see one. **Eclipses** of the moon happen more often, several times each year. They can be seen from half of Earth at a time, so are more often visible.

Whether or not you can see an **eclipse** depends on where you are on Earth. You must never look directly at a solar **eclipse**. The sun is very bright and could burn your eyes. But, it is safe to look at an **eclipse** of the moon. If an **eclipse** is predicted, it is usually big news, so you will likely hear about it.



The moon during a lunar ***eclipse***

Chapter 3

The Planets Closest to the Sun: Mercury, Venus, Earth, and Mars

Our **planet** Earth is one of eight **planets** in our **solar system** that **revolves** around the sun. The other **planets** are Mercury, Venus, Mars, Jupiter, Saturn, Uranus, and Neptune. People have been looking at the **planets** for thousands of years. People from Mesopotamia, the Greeks, Mayans, Incas, and Aztecs were all interested in the **planets**. They used just their **naked eye** to study the **planets**. Now, we have telescopes and other tools that help us get a better look at the **planets**.



A telescope

The four **planets** closest to the sun—Mercury, Venus, Earth, and Mars—are small **planets**. These **planets** have a rocky, or solid, surface.

Mercury and Venus are closer to the sun than Earth. The other **planets** are farther away.

Earth needs 365 days to make one **orbit** around the sun. That is the length of one year on Earth.

The closer a **planet** is to the sun, the less time it needs to make a **revolution** around the sun. Mercury is the closest **planet** to the sun. It needs just 88 days to make one **orbit**. Venus is the next closest to the sun. It needs just 225 days to make an **orbit**. The **planets** that are farther away take much longer. It takes Neptune 165 years to **orbit**, or revolve, around the sun!

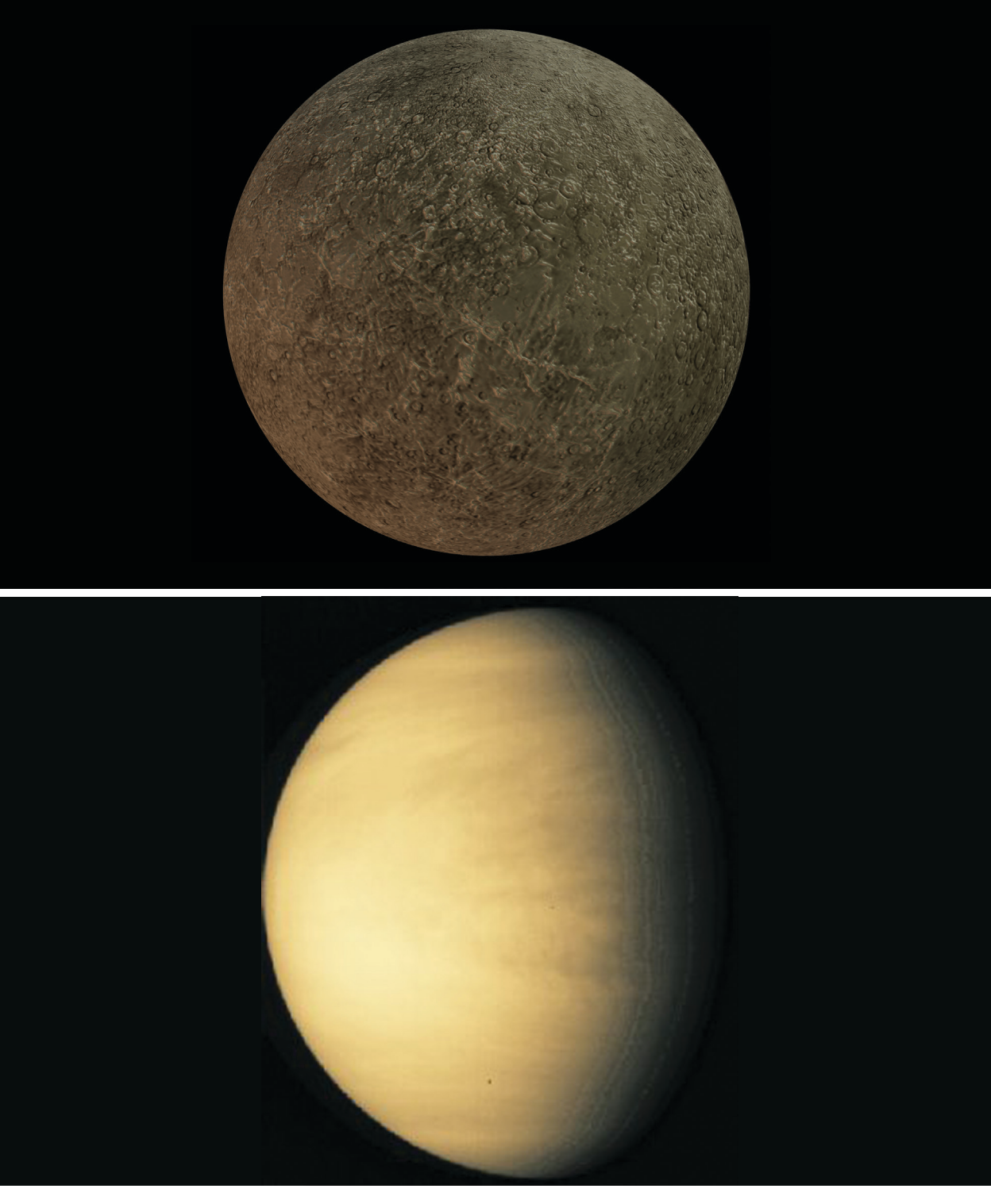


*The sun and **planets***

Besides being closest to the sun, Mercury is the smallest of all the **planets**. The English name for the **planet** comes from the Romans. They named the **planet** after the Roman god Mercury. The Greek name for this same god is Hermes.

Venus is the second **planet** from the sun and is closest to Earth. This **planet** was named after the Roman goddess of love. For a long time, scientists thought that Venus might be a lot like Earth. After all, it is close to Earth. It is about the same size as Earth and it is covered with clouds, like Earth. But this idea turned out to be wrong, too. We know now that Venus and Earth are different in lots of ways.

Scientists had to change their ideas to fit the new facts. They have now concluded that Venus is much hotter than Earth. It would not be a good place for us to live or even visit.

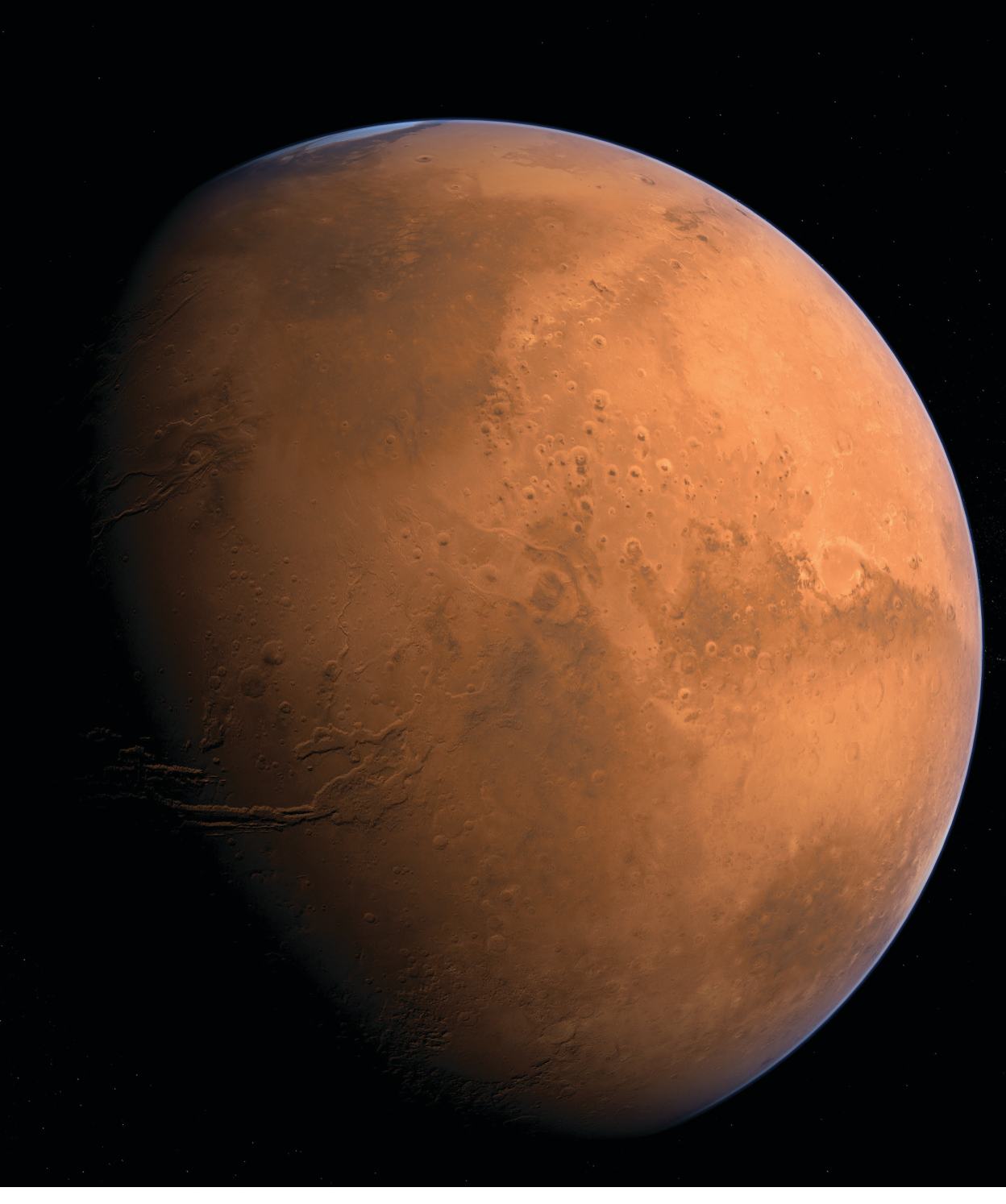


Mercury (top) and Venus

Mars is the fourth **planet** from the sun. It is named after the Roman god of war. When you look at Mars in the night sky, it looks quite red. This is because the rocks on Mars contain rust.

Many space **probes** and robots have landed on Mars. They have taken photographs and also dug up rocks.

One **probe** that went to Mars not long ago found some ice. That was big news. Ice is frozen water. If there is water on Mars, there might be life. Some experts argue that nothing could live on Mars. They say it is too cold and too dry. Others think there might be life on Mars. They think there might be something alive down under the rocks. Still others think there might have been life on Mars at one time but there isn't any now.



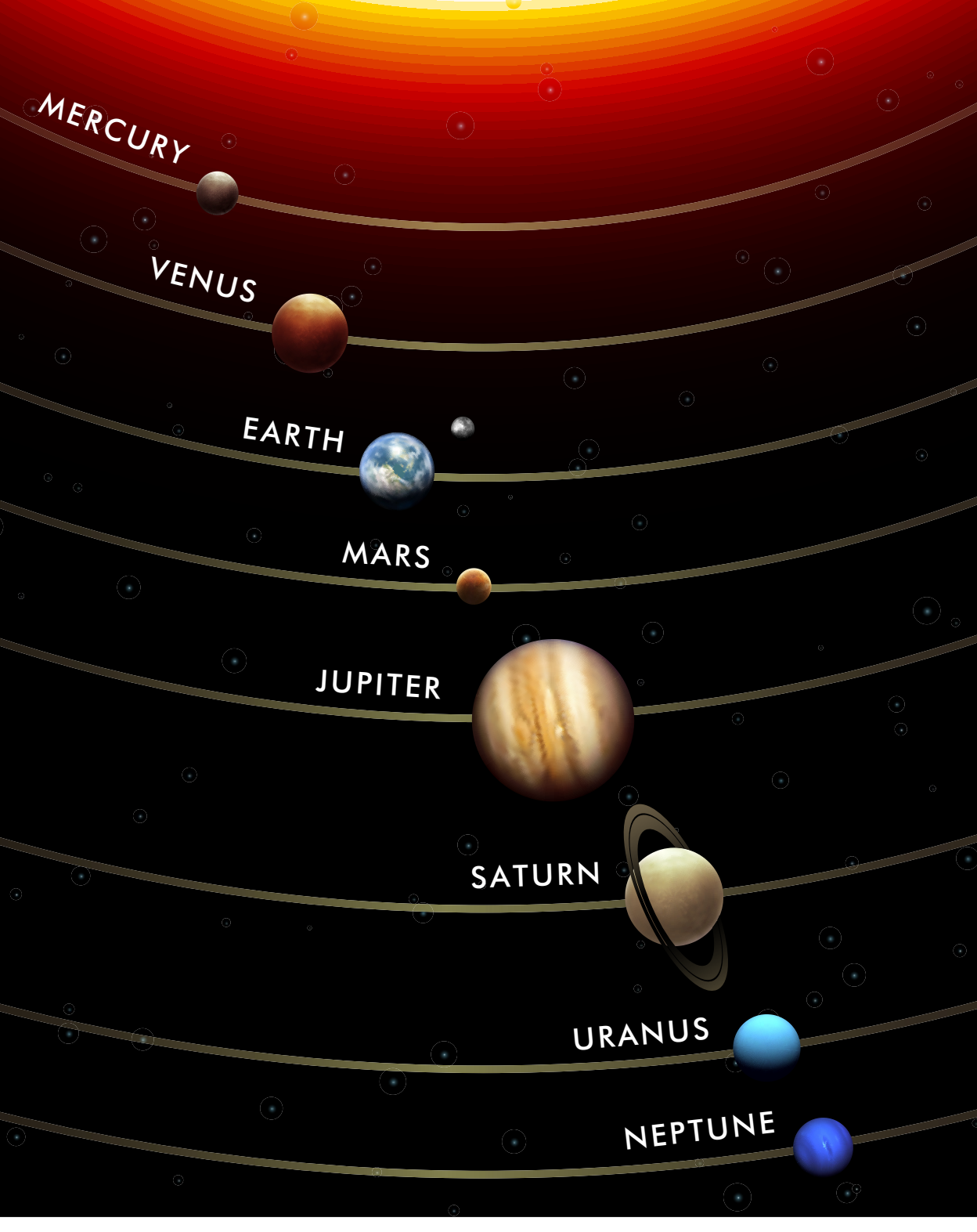
Mars

Chapter 4

The Outer Planets: Jupiter, Saturn, Uranus, and Neptune

Do you remember the names of the four **planets** closest to the sun? If you said, "Mercury, Venus, Earth, and Mars," you are right! There are four more **planets** called the outer **planets**. So there are eight **planets** in all.

Jupiter is the very next **planet** after Mars. After Jupiter come Saturn, Uranus, and Neptune in that order. Neptune is the **planet** that is farthest from the sun. Uranus is difficult to see with the **naked eye** and Neptune is impossible to see without help. Neptune is only visible using a telescope.



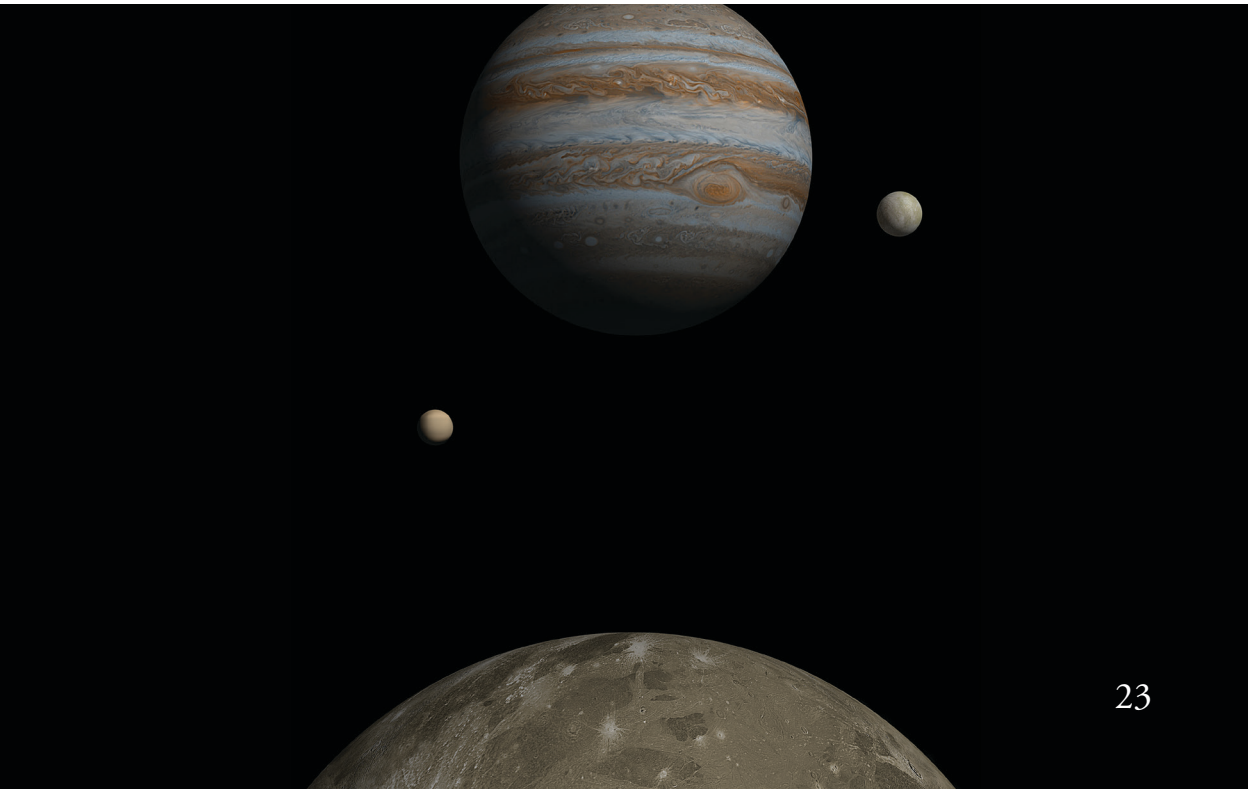
*Our **solar system:** the sun and eight **planets***

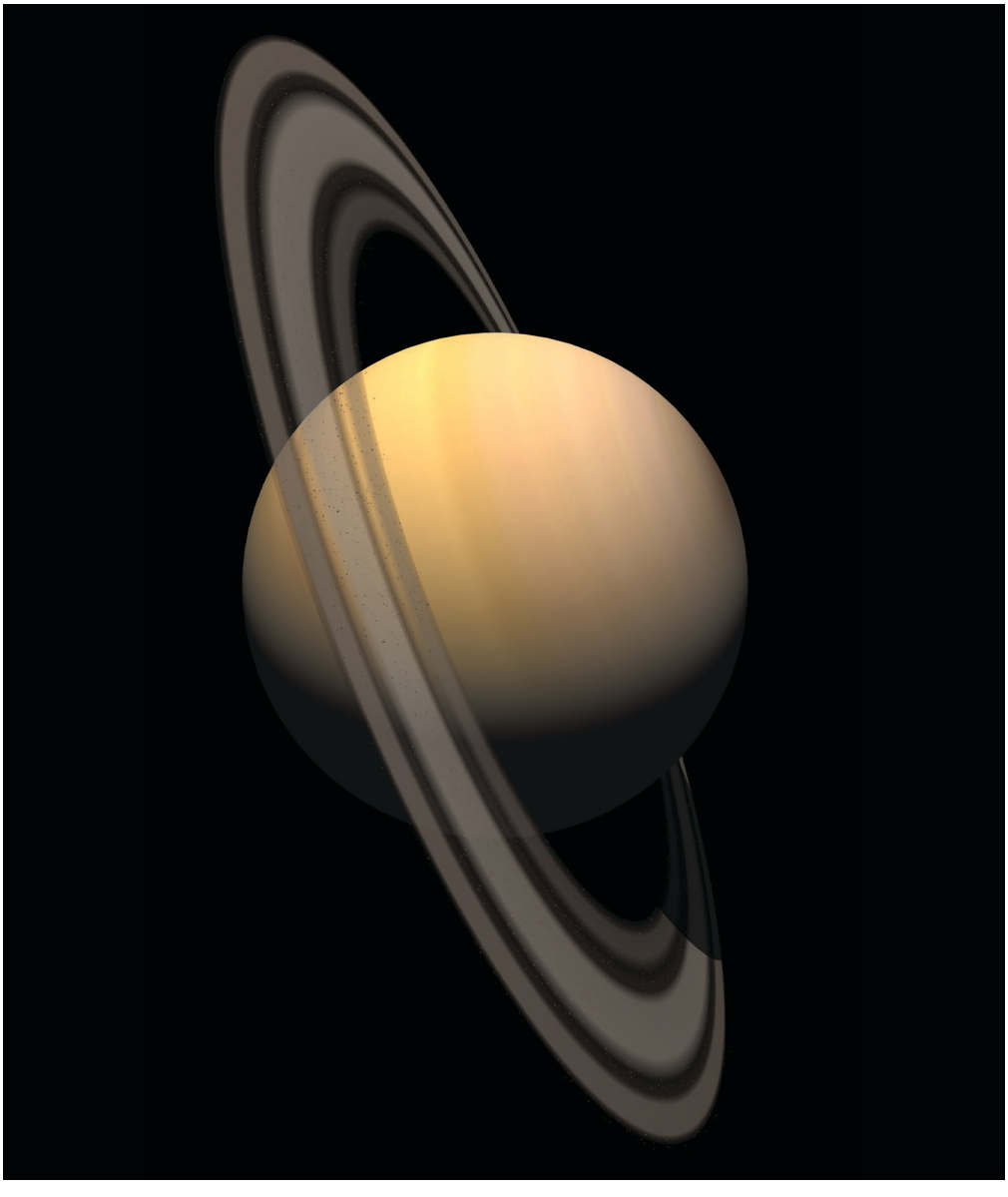
The outer **planets** are very large and are mostly made of gas. Scientists often call these **planets gas giants**. Of all the **planets**, Jupiter is the largest: 1,300 Earths could fit inside Jupiter! It is made mostly of **hydrogen** gas, the most common gas in the universe.

The gases on Jupiter seem to be blowing around. In the image of Jupiter on the next page, you can see the giant, red spot. It looks like an eye! Experts think it is a big wind storm, like a huge hurricane.

Jupiter also has 63 known moons that **orbit**, or revolve around, it. Some of these moons are very large, even larger than Earth's moon.

Jupiter and some of its moons



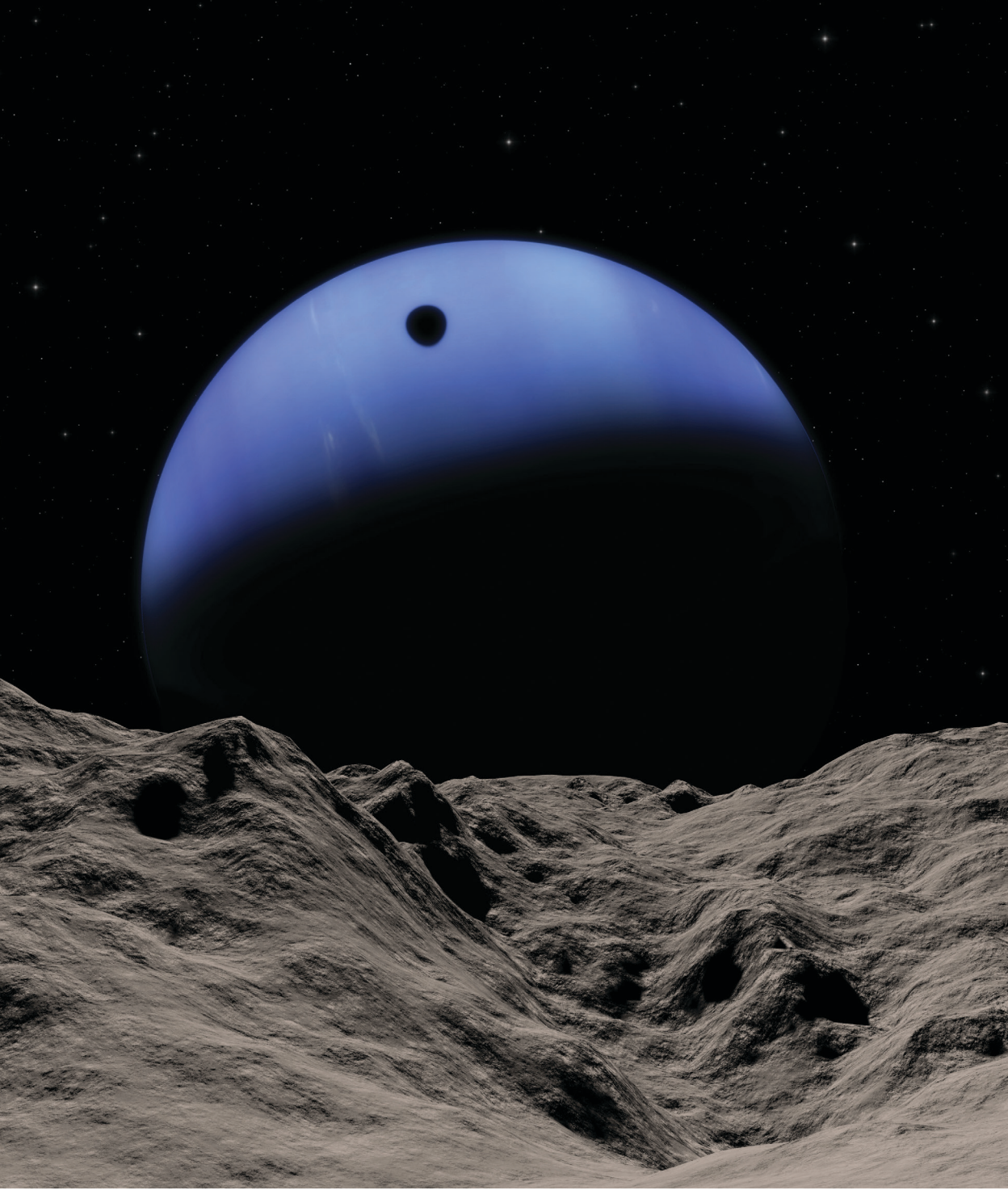


Saturn and its rings

Saturn is known for its many large rings that **revolve** around the **planet**. These rings are made of ice and dust. The ice reflects light and makes the rings glow. Saturn also has many moons that **revolve** around it.

The last two **planets** are Uranus and Neptune. These **planets** are the farthest from the sun so they are very cold. Uranus and Neptune also have rings, but they aren't easily seen like Saturn's. Both **planets** also have moons.

So now you know the names of all eight **planets**. Try asking the adults in your family how many **planets** there are. They may tell you that there are nine **planets**. When the adults in your family were in school, people said that there was a ninth **planet** called Pluto. But in 2006, scientists decided that Pluto did not have all of the characteristics needed to be classified as a **planet**. They removed Pluto's name from the list of **planets**, so now there are only eight **planets**.

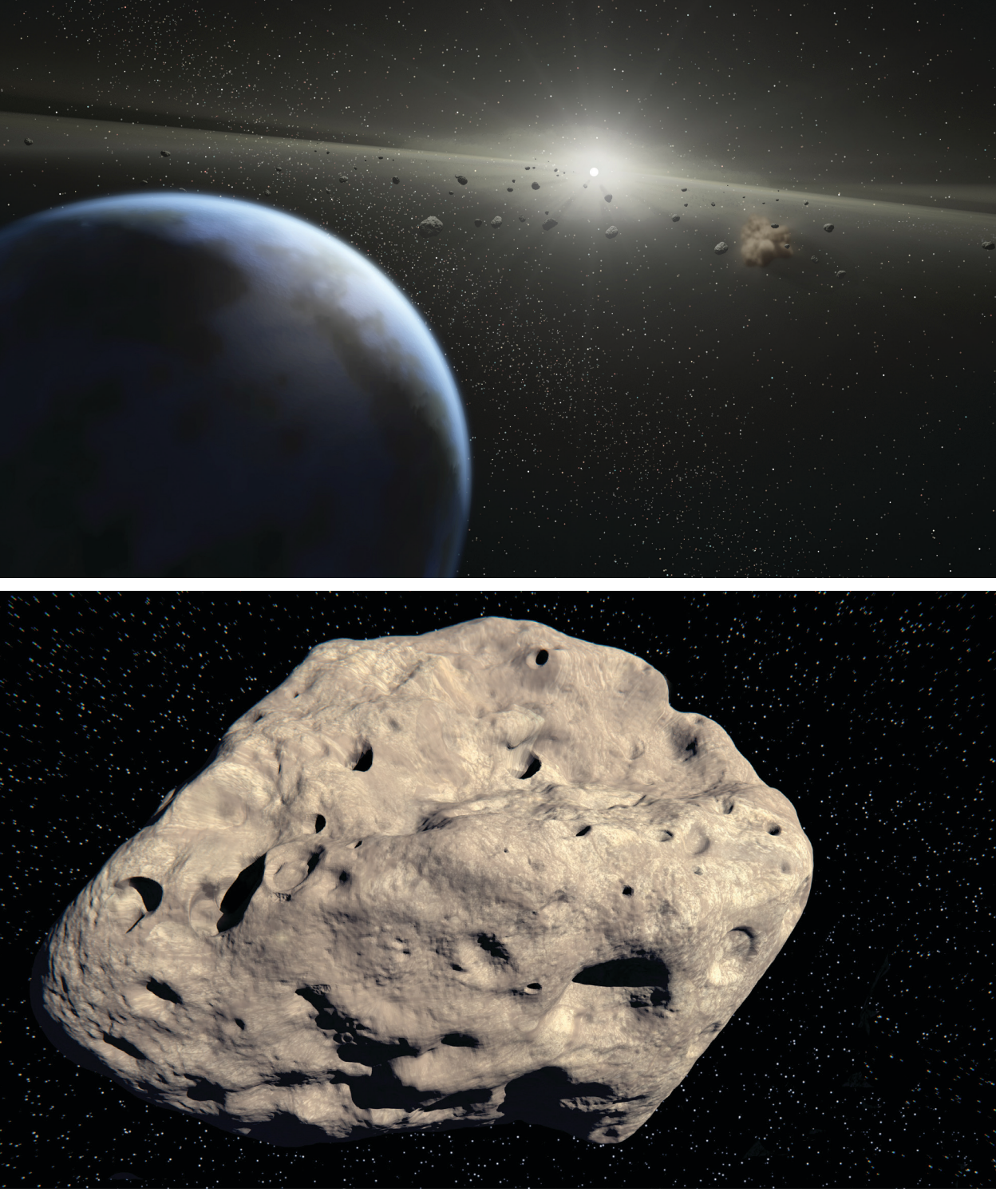


This is Neptune as it might look if seen from one of its moons. The shadow of another moon makes a dark spot on the planet's surface.

Chapter 5

Asteroids, Comets, and Meteors

There are other objects that **orbit**, or revolve, around the sun in the **solar system** besides the **planets**. Millions of space rocks called **asteroids** also **orbit** the sun. **Asteroids** are made of rock, metal, and sometimes ice. Many **asteroids** are found **revolving** around the sun between the **planets** Mars and Jupiter. They **cluster** together in a shape like a belt as they **revolve** around the sun. This part of the **solar system** is called the **asteroid belt**.



*Top: An artist's image of an **asteroid belt** around a star*
*Bottom: An up-close image of an **asteroid** from our **solar system***

Comets also **revolve** around the sun. **Comets** are made mostly of ice and dust. When a **comet** gets close to the sun, the sun's heat causes some of the **comet** to change into a gas. This gas streams off the end of the **comet** like a tail.

The most famous **comet** is **Halley's Comet**. It is named for the British scientist Edmund Halley who first discovered it. **Halley's Comet** is visible from Earth with the **naked eye** every 76 years. It was last seen in 1986. Can you figure out when it will be seen again?



*A **comet** in the night sky*

Other kinds of space rocks called **meteoroids** are also found throughout the **solar system**. When a **meteoroid** enters Earth's **atmosphere**, we call it a **meteor**. Small pieces of the **meteor** burn brightly and look like a white trail across the sky when viewed from Earth. Sometimes people call this a "shooting star." Have you ever seen one? A **meteor** "shower" is when many **meteors** can be seen falling in the sky on the same night. Sometimes they last over several nights. It's an amazing space show!

If a **meteor** doesn't fully burn up in the **atmosphere**, it falls to Earth and can make a large hole called a crater. Pieces of a **meteor** found on the ground are **meteorites.**

*Top: An artist's drawing of a **meteor** shower at night*

*Bottom: **Meteor** Crater in Arizona formed when a **meteorite** hit Earth. Notice the road and buildings to the left of the crater. This crater is very big!*

Chapter

6 Galaxies and Stars

Look up in the sky at night. What do you see besides the moon? If it is not cloudy, you may be able to see lots of stars glittering in the sky.

Remember that the sun is also a star. The stars in the night sky do not look like the sun. They do not look as big or as bright. But they are, in fact, very much alike. The stars in the night sky are big balls of hot gas, just like the sun.

So why don't they look the same? The night stars are much, much farther away from Earth than the sun. That is why they look like tiny specks of light. If we could get close to the stars, they would look bigger, brighter, and more like the sun. But the stars we see at night are so far away that no one from Earth has ever been able to get close to them.



Stars in the night sky

Scientists who study the stars and outer space are called **astronomers**. The Greek root word *astron* means star. The prefix *astro* is used in many other English words.

All stars are big balls of hot gas, but **astronomers** have discovered that stars differ in many ways. Stars can be different sizes and colors. Some stars are closer to Earth than others and some stars are hotter than others. Stars that are the hottest and closest to Earth appear brighter than other stars.



All stars are made of gases, but they can differ in size, color, and brightness.

Astronomers also discovered that stars **cluster** together in large groups. A large group of stars that **cluster** together in one area is called a **galaxy**. There are **billions** and **billions** of stars in one **galaxy**. That's a lot of stars!

The **galaxy** to which our sun and **solar system** belong is called the **Milky Way Galaxy**. It has a **spiral** shape when viewed from space. From Earth, it looks like a "milky" band of white light.



*The **Milky Way** as it appears in the night sky*

The nearest **spiral galaxy** to the **Milky Way Galaxy** is called the **Andromeda Galaxy**. It is **billions** and **billions** of miles from the **Milky Way Galaxy**. You have probably heard of a million before. A million is a huge number. So what's a **billion**? It's one thousand million! It is safe to say that the **Andromeda Galaxy** is a long, long, long way away! Even so, it is sometimes possible to see the **Andromeda Galaxy** at night.

Scientists think there are **billions** of **galaxies** in the universe. There's that number **billions** again. There are **billions** of stars in each **galaxy** and **billions** of **galaxies** in the universe—that is almost more than you can think about!



Andromeda Galaxy

Chapter

7 Constellations

Go outside one night and look at the stars. Of the **billions** of stars in our **galaxy**, it is possible to see only 2,000 with the **naked eye**. When you first look at them, you might not see much. They might look like just a bunch of tiny dots.

Look a little closer. You will see that some stars shine more brightly than others. Focus on the bright stars. Which ones really jump out at you?

Then, focus on the spaces in between the bright stars. Ask yourself, "What would it look like if I drew lines from one bright star to the next? What would it look like if I were to connect the dots? Would I see any shapes? Would I see any patterns?"

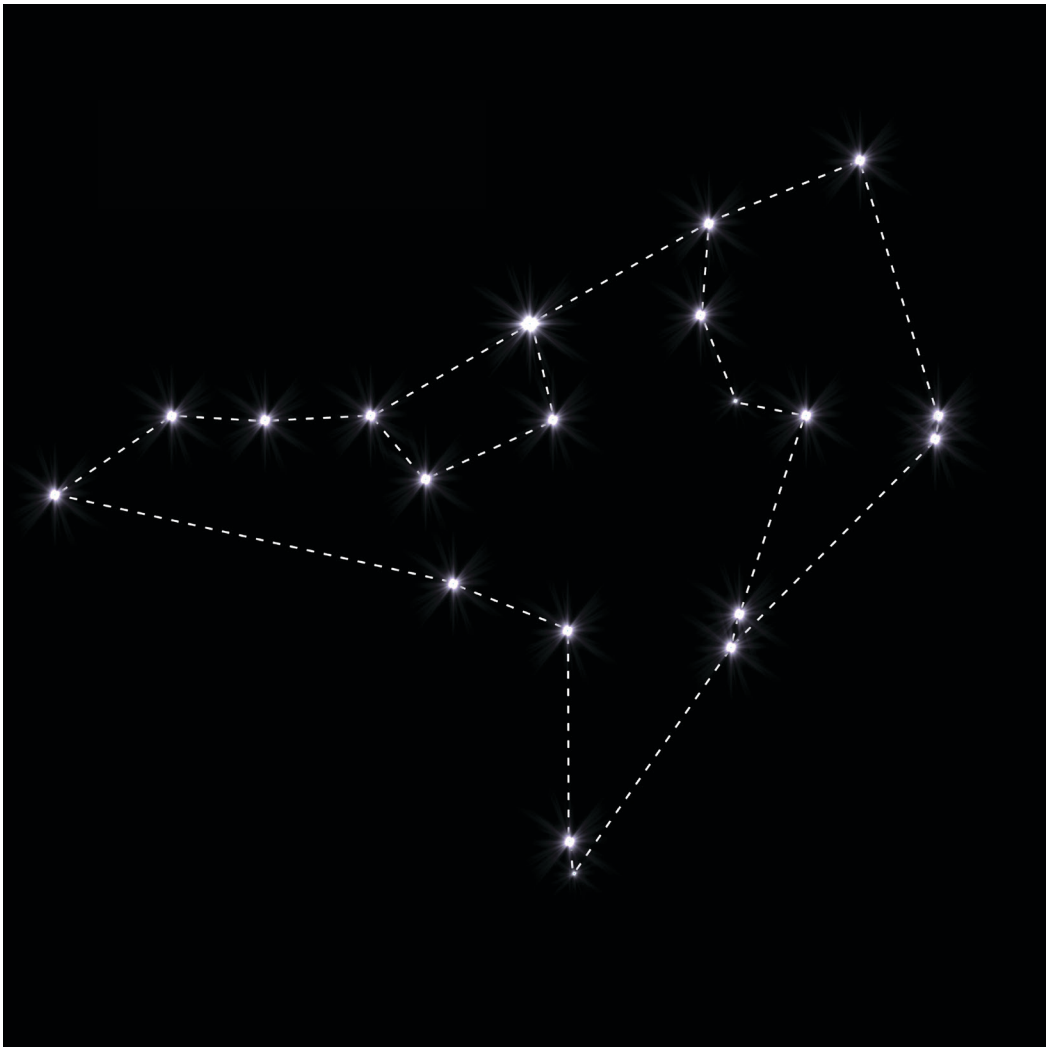
Since ancient times, people have been studying the stars. When ancient people looked at the stars, some seemed to be closer together and formed patterns.



On a clear night away from city lights, you can see the stars that fill the night sky.

One of the first people to describe these star patterns, called **constellations**, was a man named Ptolemy [TO-lə-mee]. He picked out the brightest stars and traced lines from one star to the next. He saw all types of shapes and patterns. One looked like a bull. He saw another that looked like a crab. A third looked like a bear. In all, he found 48 **constellations**. Much later, 40 more **constellations** were added to Ptolemy's list. Today, **astronomers** say there are 88 **constellations** that can be seen in the night sky.

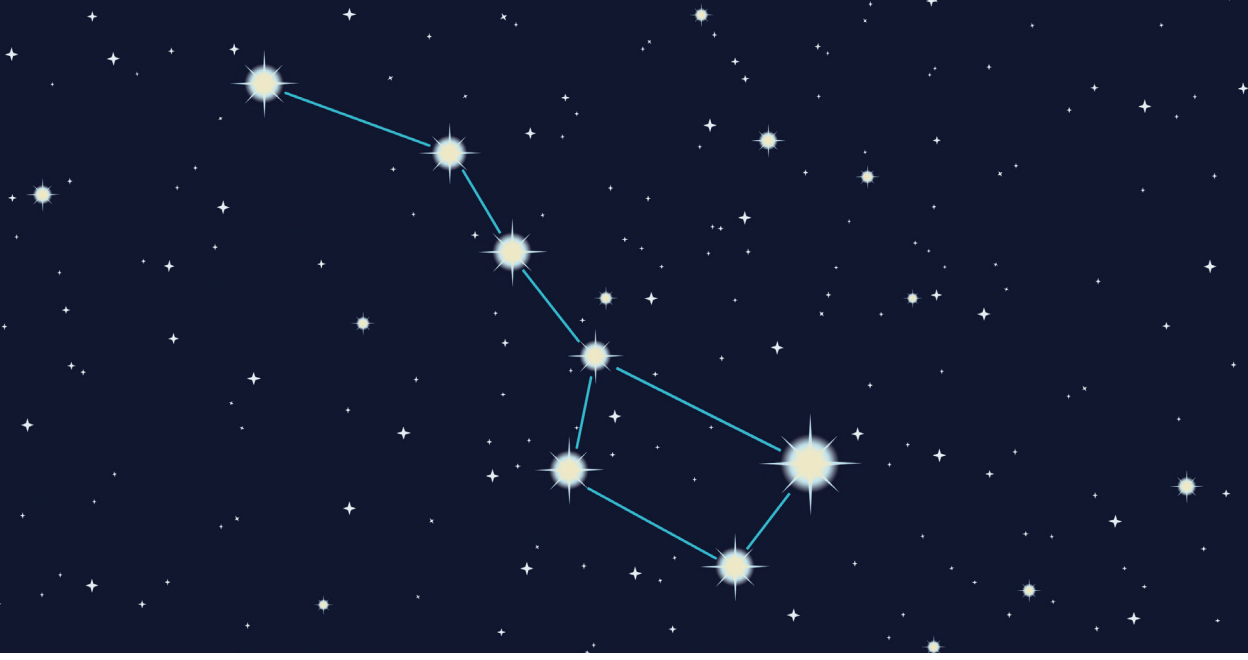
On the next page is a drawing of a **constellation** that Ptolemy described. It is called **Ursa Major** or Big Bear. The white dots or circles stand for the stars in the **constellation**. The dotted lines connect the stars and trace the pattern so you can see the shape. Do you see a Big Bear in the pattern? It does not look exactly like a real bear. So, you may need to imagine that it looks like a bear. Hint: its head is to the left with its nose being the star that is on the far left.



Ursa Major

Within **Ursa Major**, there are seven very bright stars that form another small group of stars called the Big Dipper. Look at the image at the top of the next page. Can you see why it is called the Big Dipper? When you trace a line from star to star, the shape looks like a dipper. A dipper is like a **ladle** you can use to scoop something into a bowl. The stars on the left look like the handle. The stars on the right look like the scoop.

Ptolemy also described another **constellation** called **Ursa Minor** or Little Bear. This **constellation** is also made up of seven stars. In the image on the bottom of the next page, the seven dots stand for the stars. An artist has added a drawing of a bear to help you better imagine how the star pattern looks like a bear.



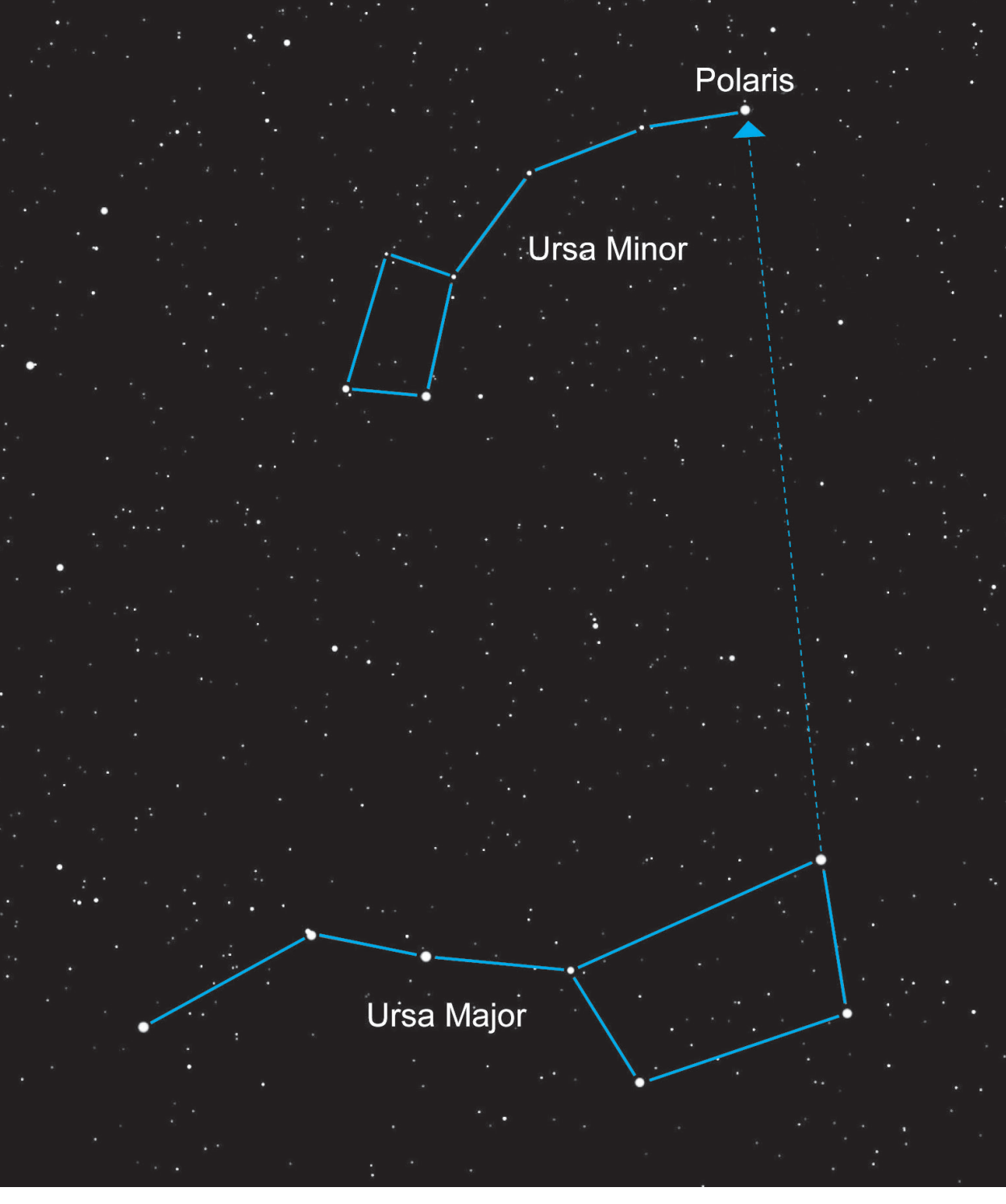
The Big Dipper

Ursa Minor



Ursa Minor is also called the Little Dipper. The brightest star at the end of the handle is called **Polaris**. Can you see it? **Polaris** stays in the same place in the night sky all year long. (Other stars are found in different places in the sky at different times of the year.) **Polaris's** place in the sky is almost directly over the North Pole of Earth. By finding **Polaris**, also called the North Star, you can find the direction north and the other directions. In ancient times, sailors and explorers used this star to find their way when they traveled.

Try to find **Polaris** the next time you look at the night sky. Start by first looking for the Big Dipper because it is easier to find. Then, find the two "pointer" stars at the edge of the Big Dipper's scoop. Then, pretend there is a long arrow pointing the same way as the pointer stars. The first star you will see at the end of the arrow is **Polaris**.



The 'pointer' stars of the Big Dipper pointing to ***Polaris****, the North Star*

Chapter

8 Exploring Space

As you have learned in the last chapters, people have been interested in studying space since ancient times. It was possible to see only some stars and **planets** with the **naked eye**. Since they were far, far away, it was impossible to see anything in very much detail.

In 1609, an astronomer named Galileo [ga-li-lae-oe] created a telescope that he used to observe the night sky. Galileo's telescope made things appear three times larger. Using his telescope, he discovered four of the many moons that **orbit** the **planet** Jupiter. He also observed the **planet** Saturn and the Milky Way.



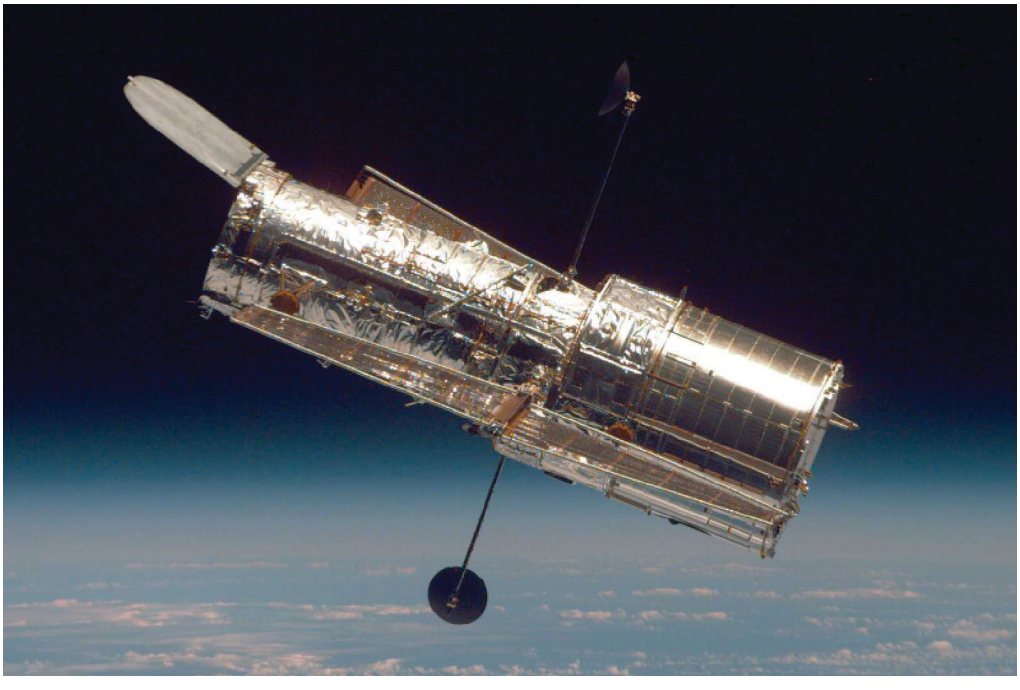
A portrait of Galileo holding a telescope

Since Galileo's time, scientists have created more and more powerful telescopes. Some telescopes are housed in large **observatories** on Earth. Often, these **observatories** are on the top of mountains, far away from any cities or lights. This allows **astronomers** to clearly see the stars and **planets**.





*Building an **observatory** on top of a mountain helps to get a better view of the sky.*



*The **Hubble Telescope** orbits Earth above its atmosphere.*

Other telescopes are **launched** into space using rockets. They travel far above Earth and have a better view of the universe than telescopes on Earth. One of these telescopes is the **Hubble Telescope**. It was **launched** in 1990 by **NASA**, the American group of scientists who study outer space. The **Hubble Telescope** is still in space today, **orbiting** Earth. Since its **launch**, it has sent back thousands of photos to **NASA**. **Hubble's** photos have led to many new discoveries about the universe. For example, using photos from **Hubble**, scientists have seen further into space, including a galaxy that is calculated to be 13.4 billion light-years from Earth.

Besides sending telescopes into space, **NASA** has also **launched** rocket ships into space. Scientists thought it was too dangerous for humans to ride the first rocket ships into space. They did not know what effects space travel might have on humans. So, **NASA** first sent chimpanzees into space on rocket ships. "Why chimpanzees?" you might ask. Think back to what you learned in a previous reader about animals. Chimpanzees are mammals and belong to the same group of animals, called primates, as humans. By studying the chimpanzees, scientists hoped to learn how space travel might affect humans.

Ham, one of the first chimpanzees launched into space



After determining space travel would be safe for humans with test flights incolving chimpanzees, **NASA** was ready to start manned space flight. In 1961, NASA built the Manned Spacecraft Center, later called the Johnson Center, just outside of Houston, Texas, the headquarters for all future space flights. And in 1961, NASA sent the first American **astronaut** into space on a rocket ship. His name was Alan Shepard. He stayed in space for only 15 minutes.



*Alan Shepard was the first American **astronaut** in space.*



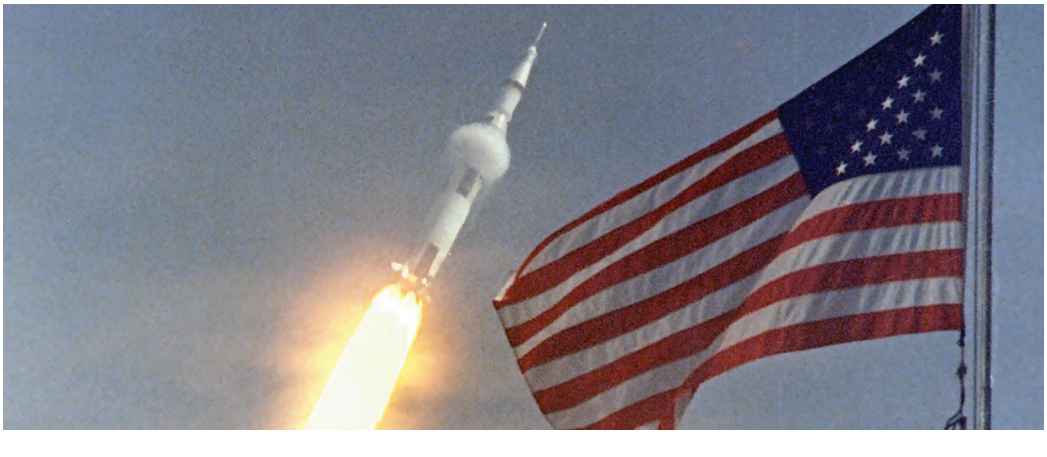
***Apollo 11** fires its rockets during lift-off.*

After 1961, **NASA** sent more **manned** flights into space. These flights **orbited** Earth but did not stop or land anywhere in space. Then, in 1969, the United States sent a rocket ship to the moon. The rocket ship was called **Apollo 11**.

Have you ever tried to throw a ball up in the air? The ball goes up at first. Then, it comes back down. No matter how hard you throw it, it comes back down because of **gravity**. **Gravity** is a **force** of **attraction** that pulls things toward one another. Earth's **gravity** pulls the ball back down to Earth.

Earth's **gravity** is a challenge for rocket ships like **Apollo 11**. In order to fly off into outer space, the rocket ship has to push up with a lot of **force**. It has to push up with so much **force** that **gravity** cannot pull it back down.

Apollo 11 fired a lot of strong rockets. It lifted off and went up slowly at first. Then, it got faster and faster. This is what it looked like after a few seconds. After just a few seconds more, it shot up out of Earth's **atmosphere** and into outer space.



***Apollo 11** shooting up into space*

Chapter 9

A Walk on the Moon

Once **Apollo 11** was up in space, the **astronauts** had to steer it to the moon. There were three **astronauts** on **Apollo 11**. You can see them in the image on the next page. Each had a job to do. One of them was in charge of flying the spaceship, called Columbia. The other two had to get into a landing craft called the Eagle. Then, they had to steer it down and land it on the moon.



The Apollo 11 astronauts

The **astronaut** who had to steer the Eagle was named Neil Armstrong. He had to find a good, flat spot to land. He also had to set the Eagle down gently.

Lots of people tuned in to watch Armstrong and the Eagle on live TV. At first, Armstrong had a hard time getting the Eagle to go where he wanted it to go. But, in the end, he landed it just fine.

Armstrong sent a message back by radio: "The Eagle has landed!"

The crowds watching it on TV went wild. They danced and sang. They shouted and waved the United States flag. For the first time ever, humans had landed on the moon!

What happened next was even more amazing. The **astronauts** went for a walk on the moon!

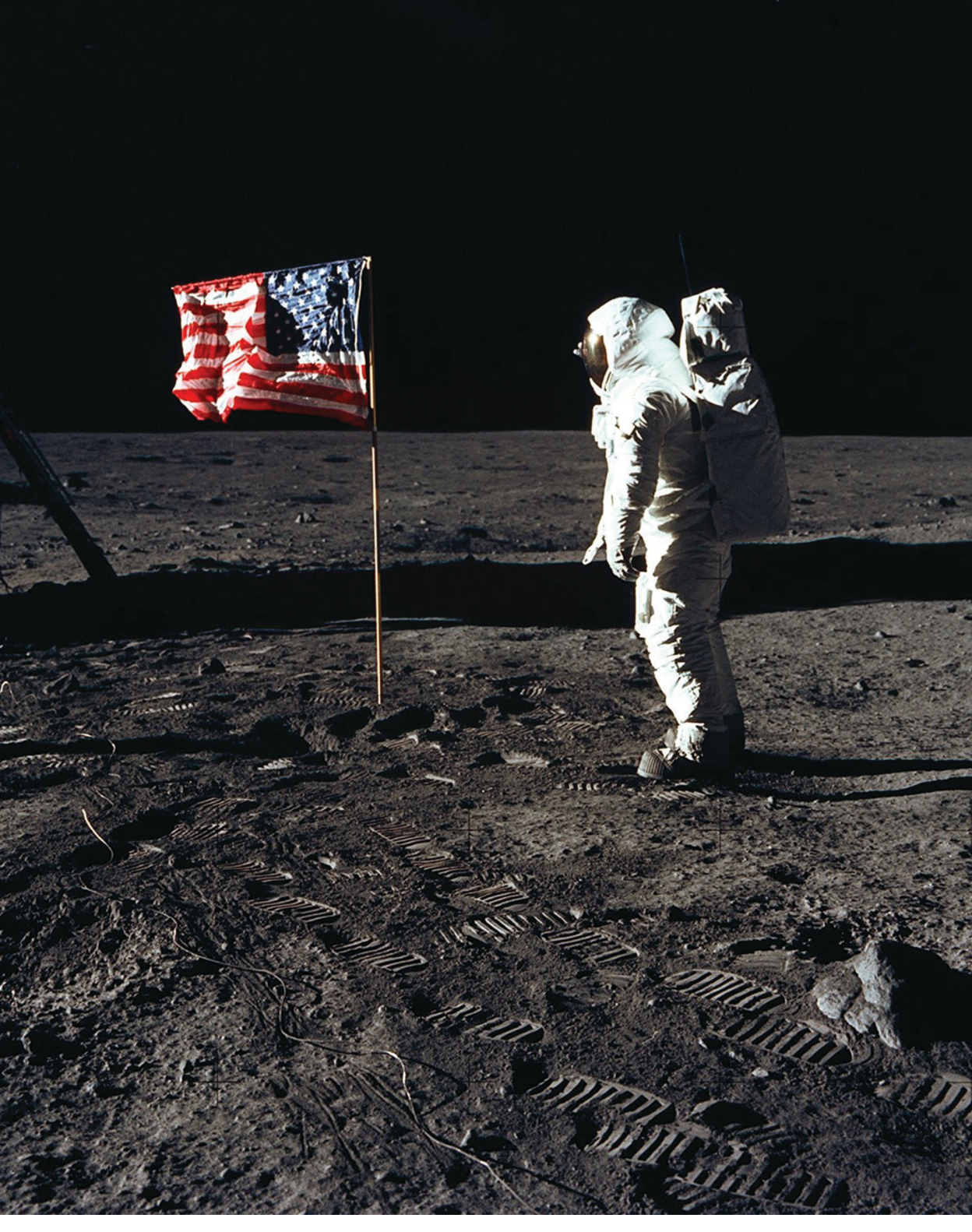


Here is one of the Apollo 11 astronauts walking on the moon. Can you see his footprints?

There is no air for breathing on the moon. It is also very cold. So, the **astronauts** could not just walk out in shorts and a T-shirt. They had to put on space suits like the one in the image on the next page. They had to wear masks. They had to carry tanks full of air for breathing.

Armstrong went out first. He went down the steps of the Eagle until he was on the last one. Then, he made a little hop. He landed on the moon and kicked up a little moon dust. Then, he said, "That's one small step for man, one giant leap for mankind." Another **astronaut** joined Armstrong on the moon. His name was Buzz Aldrin.

Once again, people watching it on TV cheered. They were proud that the United States had put a man on the moon!



Buzz Aldrin plants the U.S. flag on the moon.

While Armstrong and Aldrin were on the moon, pilot Michael Collins stayed on a part of the spaceship that was still **orbiting** the moon. Armstrong and Aldrin spent more than 21 hours on the moon. They found that it was easy to move about on the moon, which has less **gravity** than Earth. They could jump up high and seemed to float down slowly. They used different tools to explore the moon. They knew the scientists back on Earth were hoping to learn new information about the moon. They dug up samples of moon rocks to take back to Earth.

After exploring the moon, Aldrin and Armstrong got back in the Eagle. They lifted off. They met up with Michael Collins on board the other part of the spaceship. Then, all three of them flew back to Earth. The spaceship came speeding back from space and splashed down into the sea. A Navy ship came to pick up the **astronauts** and take them back to **NASA**.



Splashdown of ***Apollo 11***

Chapter

10 What's It Like in Space?

Since **Apollo 11**, many more **astronauts** have traveled in space. Scientists have learned that there are many differences between Earth and space. One of the biggest differences has to do with **gravity**. Remember that **gravity** is a **force** of **attraction** that pulls things toward one another. The **force** of **gravity** on Earth is pretty strong. Even the best jumpers can only jump a few feet off the ground. (Try it and see!)



Want to jump high? You will have to fight against gravity.



*This **astronaut** is inside a spaceship in space, where the **force** of **gravity** is less.*

Remember that on the moon, **astronauts** Aldrin and Armstrong were easily able to jump up high. They didn't come down quickly either. Instead, they seemed to float down slowly. That was because the **force** of **gravity** on the moon is not as strong as on Earth. The moon is not as big as Earth. So the **force** of **gravity** is not as strong on the moon.

If you think that is cool, wait until you read what happens out in space, away from the moon or **planets**. Out in space, **astronauts** do not feel the effects of **gravity**. They and their spaceship are moving freely in space. Since the **astronaut** and spaceship are moving freely together, the **astronauts** look and feel as if they are floating!

Up in space, lots of things are different. You can do a flip and not worry about whether you will make it all the way around before you come down!



*When you are free of the effects of **gravity**, it is easier to do flips and cartwheels.*



*Look, no hands! These **astronauts'** lunches appear to be floating!*

Eating is different in space, too. I'll bet when you eat lunch at school, your food stays where you put it. If you set it on a table, it stays there until you pick it up. The **force** of **gravity** holds it down. But if you were up in space, you and your food would be moving freely together. If you let go of it, your food might drift away!

There are other differences in space besides less **gravity**. Do you remember that the **astronauts** on the moon had to carry tanks of air for breathing? Another way outer space is different from Earth is that there is no air or oxygen at all in outer space. Look again at the image on page 69 of the **astronauts** inside the spaceship. The **astronauts** are not carrying tanks of air. That's because oxygen is being pumped inside the spaceship.

Since there is no air in space, you also do not hear sounds in outer space. It is also very cold in space. The **astronauts** must train many months before going into space so they know what to expect. Do you think you would like to go into space some day?



This is what Earth looks like from the moon. Can you name some ways that being in space is different from being on Earth?

Chapter

11 The Space Shuttle

Interest in **manned** space exploration soared after **Apollo 11**. Other **astronauts** went to the moon. But scientists were also interested in exploring other parts of space beyond the moon. It was very expensive and took a lot of time to build and send spaceships into space. Do you remember that when **Apollo 11** returned from space, it landed in the sea? It was not able to land safely on the ground, so this type of spacecraft always had to land in the sea. Once it landed in the sea, this kind of spacecraft could not be used again.

In 1981, a **reusable spacecraft**, called a **space shuttle**, was built. It was able to fly up into space and then zoom back down to Earth. When it returned to Earth, the pilot was able to land the spacecraft on a runway almost like an airplane. It glided down from space and landed on a runway, but it had to be a very long runway.



*A **space shuttle** lifts off*

The **space shuttle** was flown back into space again and again. It **shuttled** back and forth between Earth and space. That is why it was called the **space shuttle**.

The image on the previous page shows the **launch** of a **space shuttle**. The **space shuttle** itself is the white part that looks like a jet plane. The other parts are **booster rockets**. The **booster rockets** helped the **space shuttle** get off the ground. They helped the **space shuttle** overcome Earth's **gravity**. Once the **space shuttle** was up into space, it dropped the **booster rockets** because it no longer needed them.



*A **space shuttle** in orbit above Earth*

In the thirty years between 1981 and 2011, different **space shuttles** carried **astronauts** up into space on many missions. The **space shuttle** was also used to bring research equipment and tools into space. The **astronauts** did many experiments to find out more about space. Scientists were **especially** interested in learning about what effect the lack of **gravity** would have on humans and other living things.

The **space shuttle** was also used to help build an amazing space station. **Astronauts** could live at the space station for months at a time. Often, the **space shuttle** carried supplies back and forth from Earth to the space station. It also provided a ride home to Earth when it was time for the **astronauts** to return.

The last **space shuttle** mission took place in July 2011. **NASA** scientists and Americans were proud of everything the **astronauts** had accomplished in thirty years. With the end of the **space shuttle** missions, **NASA** is planning other ways to explore space. Those plans include **launching unmanned probes** and **satellites**. **NASA** scientists hope to learn more about the moon's **gravity** and are even talking about trying to explore **asteroids**!



*A **space shuttle** comes in for a landing.*

Chapter

12 Dr. Mae Jemison

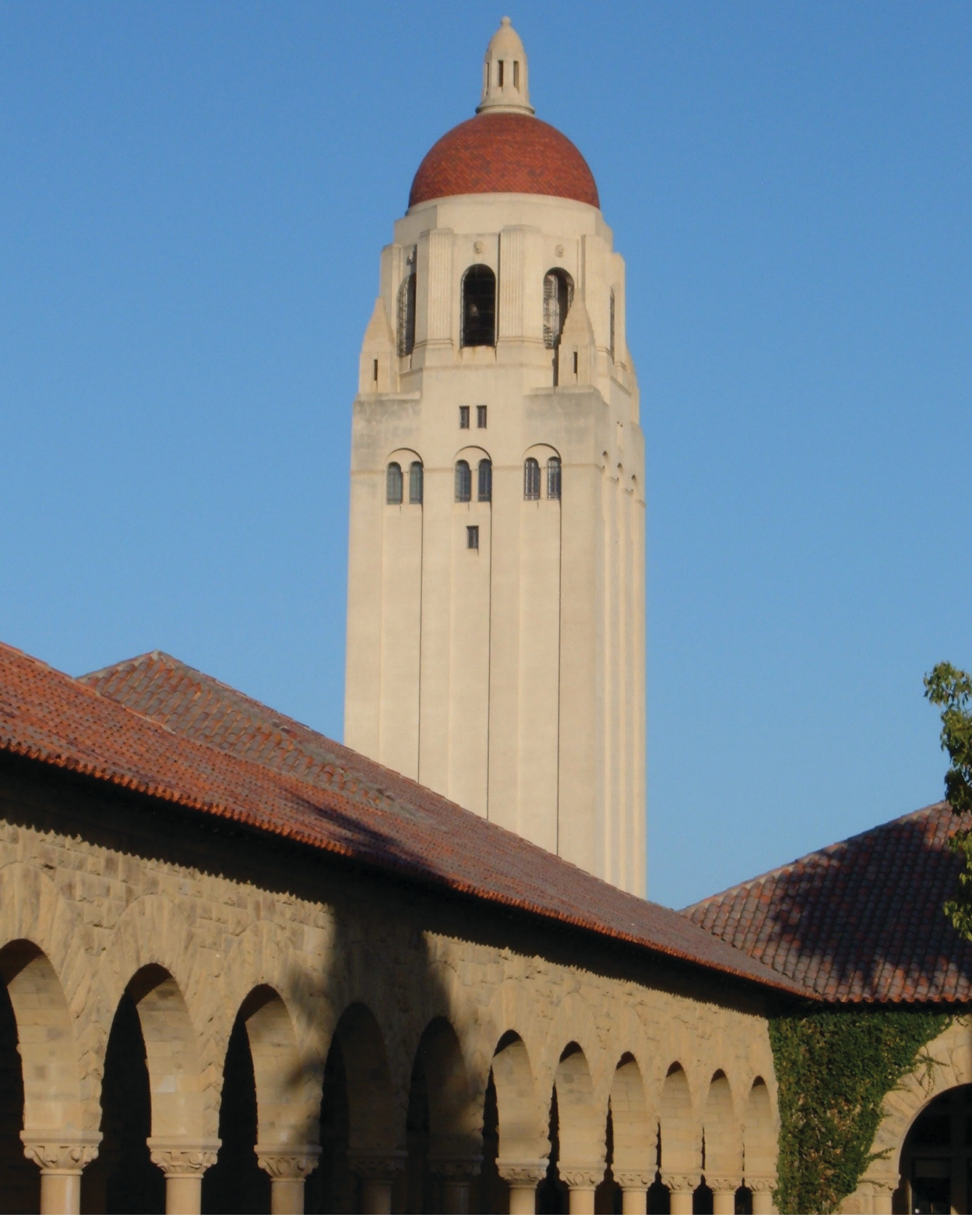
Do you know what a role model is? A role model is someone who sets an example for others by the way they live. Many students admire people who are famous athletes, movie stars, or singers and use them as role models. They see them on TV, in newspapers and in magazines, and decide they want to be like them. But some of the best role models are people that you probably would not see on TV or in newspapers. They have jobs such as doctors, teachers, or police officers. Some are scientists and **astronauts**. One such person is Mae Jemison.



Mae Jemison

Mae Jemison was born October 17, 1956, in Decatur, Alabama. Her family moved to Chicago, Illinois when she was young. Mae always took great pride in her schoolwork. She was interested in science, but was also interested in the arts. She finished high school early at age 16! From there, she went to Stanford University in California. Most college students focus on only one topic of study because college is so challenging. Mae focused and excelled in two topics of study—chemical engineering and African-American studies!

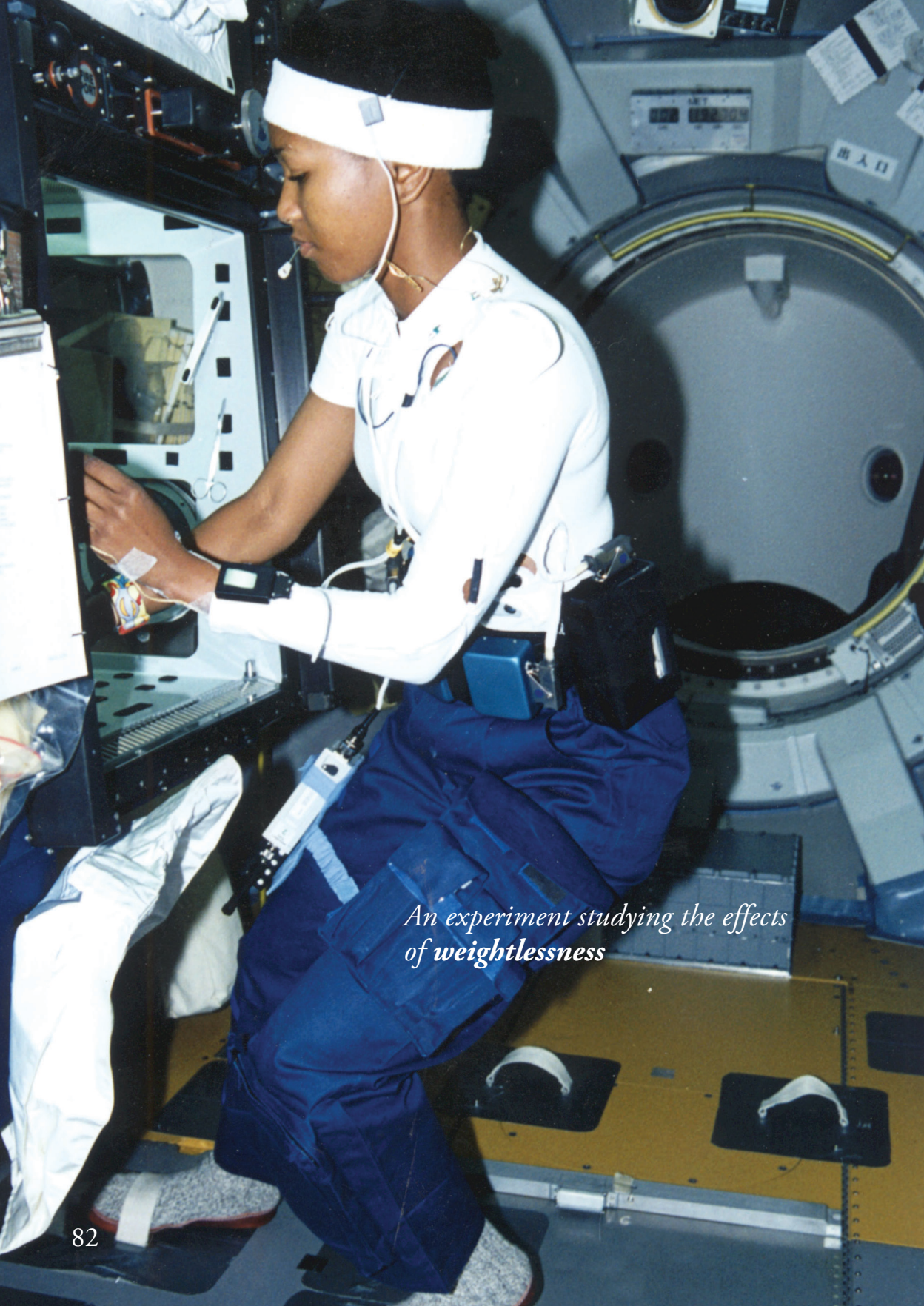
After Stanford, Mae entered medical school to become a doctor. She wanted to use her medical training to help people in different countries on the continent of Africa. To do this, she joined the **Peace Corps** as a volunteer. As part of the Peace Corps, Mae treated patients and also helped train other **health care** workers. She worked hard to help improve health care in the countries where she worked.



Stanford University, where Mae went to college

After the **Peace Corps**, Mae came back to the United States. She set her sights on a different goal. Her greatest dream was to become an **astronaut** and travel into space. She decided to apply to **NASA** to become an **astronaut**. But the first time she applied, she was not accepted. Instead of giving up, she tried again and **NASA** accepted her the second time! She was one of only 15 people chosen from a group of 2,000 people who wanted to become **astronauts**!

Her training to become an **astronaut** was hard. She had to get into great shape and train to get used to being free of the effects of **gravity** in space. She also had to study and pass many tests about space travel. Mae Jemison succeeded in both.



*An experiment studying the effects of **weightlessness***

In 1992, Mae was chosen for a mission on the ***Endeavour*** **space shuttle**. A rocket **launched** the ***Endeavour*** into **orbit** around Earth. Mae became the first African-American female **astronaut** in space!

The mission was to study the effects of weightlessness on plants and animals. Mae conducted experiments during the mission with fellow **astronaut** Jan Davis. They collected information that the scientists at **NASA** could study. The mission was a great success.

After her successful mission, Mae retired from **NASA**. She became a professor at Dartmouth College, sharing her love of science and space with other students. She also started her own company called The Jemison Group, Inc. Mae's company searches for ways that science can help improve the lives of people in countries around the world. Mae Jemison is truly a role model that we can all admire!



*Mae Jemison achieves her goal of becoming an **astronaut**.*

Chapter 13

The International Space Station

Would you like to have a bedroom in outer space? Some **astronauts** do!

The United States and other countries use the **space shuttle** to send **astronauts** to an **international** space station. The space station **orbits** Earth. Three **astronauts** can live there at one time. They stay for six months at a time. This image shows the space station.



The space station orbits Earth.

The space station **orbits** far above Earth. So the **astronauts** in the space station don't feel the effects of **gravity** like we do on Earth. When we lift our arms and legs here on Earth, we have to work against **gravity**. That is good for us. It helps us stay in shape. But **astronauts** in space don't have the effects of **gravity** to work against. They do not get much of a workout from drifting around. They have to run at least once a day to stay in good shape. In this image, you can see an **astronaut** jogging in space.

Astronauts have to jog in space to stay in shape.





These two ***astronauts*** *are taking a nap in space.*

These two men are sleeping in space. They don't feel the effects of **gravity** so they are moving freely within the spaceship. This means they can sleep right side up or upside down. It is all the same. Do you think you would like sleeping this way?

Taking a shower in space is tricky. On Earth, the water comes out of the spout. It falls down and splashes on your body. Then, it runs off. But this is not what happens in space! In space, you have to rub the water on your skin. Also, it does not just drip off. You have to scrape it off. You have to shower in a little pod. The pod keeps the water you scrape off your skin from drifting off in the air. If it drifted off, it might cause problems. It might mess up the computers and equipment inside the space station.

You can see that lots of things are different when you live in space. That is why leaving the space station and coming back to Earth can be hard. It takes time for the **astronauts** to get used to Earth again. After months in space, they struggle with the **gravity** on Earth. Their arms and legs feel heavy. They find it hard to stand up. They feel off balance. But in a few weeks, they begin to feel normal again. Sometimes when they look up at the sky, they even feel a little homesick for their home in outer space.

Chapter 14

Nicolaus Copernicus

Do you remember in the very first chapter of this reader you learned that long ago, people believed that the sun moved around Earth? This seemed to make sense. Each morning at the start of the day, the sun rose in the east. At the end of the day, the sun set in the west—exactly opposite from where it had come up. To explain this change, people said the sun moved around Earth. This is what the Greeks and other ancient people believed. But you also learned in the first chapter that this was not true.

About the same time that Christopher Columbus arrived in America, a man named Nicolaus Copernicus was studying math and astronomy at a university in Poland. He later moved to Italy where he also studied medicine and law.



Young Copernicus studied math, astronomy, medicine, and law.

But Copernicus' real love was astronomy. He knew that since ancient times, people believed that the sun moved around Earth. Copernicus began to carefully observe and record the movement of the sun, **planets**, and stars. After much research, Copernicus decided that the belief that the sun moved around Earth could not be true. Copernicus' observations led him to believe just the opposite! He realized that instead, Earth was moving around the sun! He also believed that as Earth **orbited** the sun, it also completed a full **rotation** each day.

All of Copernicus' ideas came from viewing space without the help of a telescope. He wrote down what he observed from a cathedral bell tower. He also used math to help him prove his point. Finally, Copernicus wrote a book explaining his new ideas about how the universe worked. His fellow scientists went to work trying to prove him wrong, but they couldn't. Most were amazed by his discovery!



Copernicus spent hours observing the movement of the stars, planets, and sun.

However, Copernicus' ideas were different from what people had believed for thousands of years. They believed that Earth and humans were the center of the universe. Many of the teachings of the church at that time were also based on this belief. Copernicus had suggested that Earth was not the center of the universe. Instead, he said, the sun was at the center! Some people disagreed with Copernicus' ideas and spoke out against them. So, his beliefs were not widely accepted while he was alive.

After Copernicus died, other scientists and church officials continued to argue against the view that the sun was at the center of the universe. Some scientists agreed with Copernicus' ideas. Galileo agreed with Copernicus and was punished and put in jail for a long time.

Today we know that Copernicus's ideas led to our current understanding of how the solar system works. The sun is at the center, and the planets revolve around it in elliptical orbits. His work led to other theories and discoveries as well. Even today, scientists continue to learn new things about the universe, so our knowledge is always changing and growing.



Copernicus argued that the sun, not Earth, was at the center of the universe.

Glossary for *What's in Our Universe?*

A

Andromeda Galaxy—the spiral galaxy that is closest to the Milky Way Galaxy

Apollo 11—a rocket ship that took three American astronauts to the moon in 1969

asteroid—a space rock, smaller than a planet, that revolves around the sun (**asteroids**)

asteroid belt—an area between Mars and Jupiter where thousands of asteroids revolve around the sun in a shape like a belt

astronaut—a person who travels into outer space

astronomer—a scientist who studies stars, planets, and outer space (**astronomers**)

atmosphere—an invisible, protective blanket of air around Earth and other heavenly bodies

attraction—when things are drawn to move closer together

axis—an imaginary straight line through the middle of an object, around which that object spins

B

billion—a very large number (**billions**)

booster rocket—one of two parts of a space shuttle that helps launch it into space by overcoming gravity (**booster rockets**)

C

comet—a frozen ball of dust and ice that travels through outer space (**comets**)

constellation—stars that form a pattern or shape that looks like such things as a person, an object, or an animal as seen from Earth (**constellations**)

courage—bravery

E

eclipse—the blocking of the light from the sun by another heavenly body (**eclipses**)

Endeavour—a NASA space shuttle

especially—very much, particularly

exploration—the study of unknown places or things

G

galaxy—a very large cluster of billions of stars, dust, and gas held together by gravity and separated from other star systems by a large amount of space (**galaxies**)

gas giant—one of the large outer planets, Jupiter, Saturn, Uranus, and Neptune, that is composed of mainly hydrogen gas (**gas giants**)

gravity—a force that pulls things toward one another

H

Halley's Comet—a famous comet named for British scientist Edmund Halley that is visible from Earth with the naked eye every 76 years

health care—the prevention or treatment of illnesses by trained medical specialists

Hubble Telescope—a large telescope that collects information in space; It was carried into space in 1990 and will be there until 2014.

hydrogen—the most common gas in the universe, which is lighter than air and easily catches fire

I

imagine—to pretend

international—involving more than one country

L

ladle—a spoon or dipper with a long handle and a cup-like end used for serving liquids

launch—to send a rocket into outer space (**launched**)

M

manned—carrying and operated by people

meteor—a piece of rock that burns very brightly when it enters Earth's atmosphere from space, also called a shooting star (**meteors**)

meteorite—a meteor that does not fully burn up in Earth's atmosphere and falls to Earth

meteoroid—a space rock, smaller than an asteroid, that orbits the sun (**meteoroids**)

Milky Way Galaxy—the galaxy that contains Earth and the solar system in which it lies

N

naked eye—your eye

NASA—National Aeronautics and Space Administration; an organization in the United States that directs space travel and research

O

observatory—a place used to observe the sun, moon, stars, and outer space (**observatories**)

orbit—the curved path something in space takes around another object in space; Planets move in an orbit around the sun. (**orbiting**)

P

Peace Corps—a group of American volunteers who carry out projects in other countries to help improve the lives of people living there

planet—a round object in space that orbits a star (**planets**)

Polaris—the North Star; the brightest star at the end of the handle of the Ursa Minor/Little Dipper that stays in the same place in the night sky all year long

probe—a tool used to explore something, such as outer space (**probes**)

R

research—the kind of equipment used to collect information through experiments

reusable—when something can be used more than once

revolve—when one object moves around another central object or point (**revolving**)

rotate—to turn about an axis or a center (**rotating**, **rotates**, **rotation**)

S

satellite—a natural or man-made object that orbits a planet or smaller object (**satellites**)

shuttle—to go back and forth from one place to the next (**shuttled**)

solar system—the sun, other bodies like asteroids and meteors, and the planets that orbit the sun

spacecraft—a manned or unmanned vehicle designed to travel into space for research and exploration

space shuttle—a manned spacecraft used for exploration

space station—a manned satellite that is made to be in outer space for a long period of time

T

tilted—slanted or tipped to one side

U

unmanned—not carrying people

Ursa Major—the constellation named by Ptolemy that is also called Big Bear; It includes the Big Dipper

Ursa Minor—the constellation made of seven stars named by Ptolemy that is also called Little Bear; It is the Little Dipper

V

volunteer—a person who willingly performs a service without getting paid

W

weightlessness—to have little or no weight

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Bluebonnet Learning
K–5 Reading Language Arts

ENGLISH

WHAT'S IN OUR UNIVERSE?

GRADE 3 UNIT 6 | READER

EDITION 1

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