SPACE SCIENCE

3–8 Science Unit Study



THE GOOD AND THE BEAUTIFUL

SPACE SCIENCE

CREATED BY THE GOOD AND THE BEAUTIFUL TEAM

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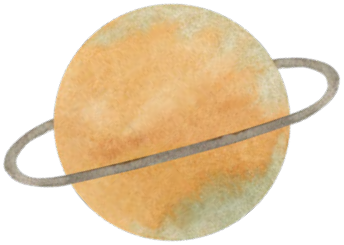
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UNIT INFORMATION

Science Journal



All The Good and the Beautiful science units include activities in a student journal. Each student should have his or her own student journal, and the parent or teacher will direct the student regarding when to complete the activities in the lessons. The journal can be purchased by going to **goodandbeautiful.com/science** and clicking on the *Space Science* unit link.

Science Wall



All science units include vocabulary words to be placed on your science wall, which is a wall or trifold presentation board in your learning area on which you can attach the vocabulary words and other images. **Cut out the vocabulary word cards at the beginning of the unit.** The course will indicate when to place them on the wall.

Lesson Preparation



All science units include easy-to-follow lesson preparation directions at the beginning of each lesson.

Activities



Many of The Good and the Beautiful science lessons involve hands-on activities. The *Space Science* unit features activities that involve potentially messy and/or harmful materials. Adult supervision is recommended for all activities and experiments as some require sharp objects, heat sources, or small objects that could be a choking hazard for young children.



Unit Videos



Some lessons include videos that were created by The Good and the Beautiful. Have a device available that is capable of playing the videos from **goodandbeautiful.com/sciencevideos** or from the Good and Beautiful Homeschool app.

Content for Older Children



Some lessons include extra content that is more applicable for older children (grades 7–8). Parents or teachers may choose to skip this content if instructing only younger children.

Content for Younger Children



Some lessons include extra content that is more applicable for younger children (grades 3–6). Parents or teachers may choose to skip this content if instructing only older children.

Worldview

The unit takes a general Christian worldview that supports creationism. The unit does not attempt to define how long it took God to make items in the universe, thus allowing for use by both those who believe in a young earth theory and those who believe in an old earth theory. If parents want to get into more detail on dates and time periods, they can include the doctrines specific to their own beliefs.

Versions

New discoveries are being made on an ongoing basis. This course is reviewed and revised periodically to keep information as up to date as possible. This version is the third edition of this unit.

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READ-ALOUD BOOK PACK

The two books below are optional read-aloud books that complement this unit. These books can be purchased as a book pack by going to **goodandbeautiful.com/science** and clicking on the *Space Science* unit product page.

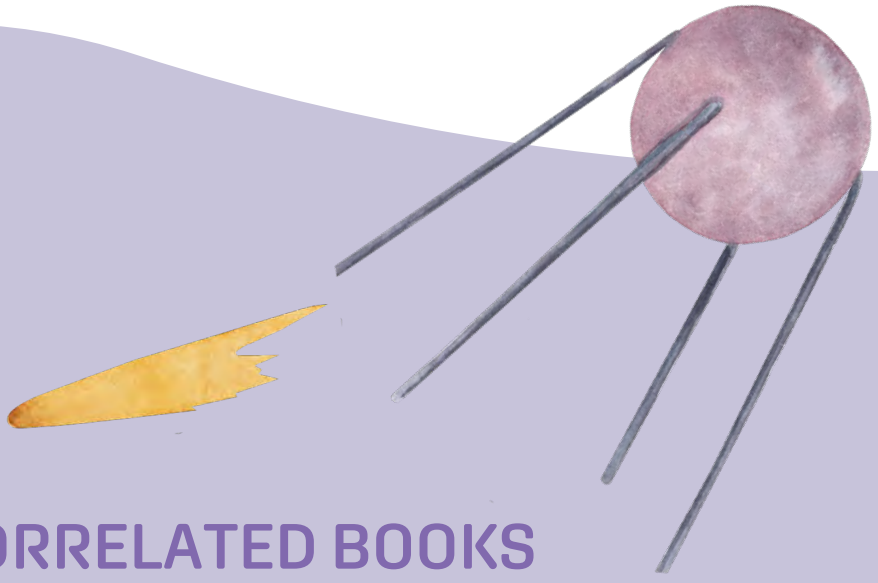


Mars Exploration: 1960–2016
By Megan Noel



The Story of Mae Jemison
By Amy Drorbaugh





CORRELATED BOOKS

The Good and the Beautiful Bookshop has several books that correlate well with the *Space Science* unit. It can be a wonderful experience for children to read books on their level related to the subjects they are learning in science. The bookshop includes both fiction and nonfiction books that are organized according to reading level. Find these correlated books by going to **goodandbeautiful.com/science** and clicking on the *Space Science* unit product page.

GRADES 7–8

LESSON EXTENSIONS

How the Extensions Work

Each lesson has an optional lesson extension for children in grades 7–8. Complete the lesson with all the children, and then have the older children complete the self-directed lesson extension. These extensions are located in the *Grades 7–8 Student Journal*.

Answer Key

The answer key for the lesson extensions can be found on the free Good and Beautiful Homeschool app in the science section. Visit **goodandbeautiful.com/apps** for information on accessing the app. The app can be accessed from a computer, phone, or tablet.

Flexibility

The amount of time it will take to complete each lesson extension will vary for each child. The average time is about 10–15 minutes per extension. Parents, teachers, and children may choose to omit parts of the lesson extension if desired. Encourage the children to stretch their capabilities, but also reduce work if needed.

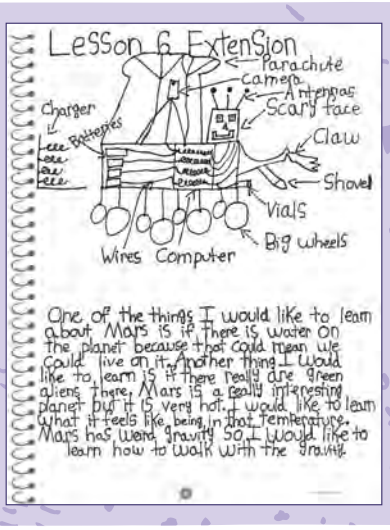
Taking Notes

Some of the grades 7–8 lesson extensions have the children summarize the material read. Teach the children to look for key information, summarizing the most important points. Students can also add notes with their thoughts and the facts that are most interesting to them.

Optional Grades 7–8 Reading Book

We recommend *Apollo 13* by Natalie Goodson as extra reading for students in grades 7–8. This book can be purchased by going to **goodandbeautiful.com/science** and clicking on the *Space Science* unit link.





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SUPPLIES NEEDED

You will need the following supplies for activities. There are no experiments in this unit.

Lesson 1

- 4 plastic storage bags of varying sizes: one snack size, two sandwich size, one gallon size
- 1 small ball that will fit in the smallest plastic bag
- 6-sided die
- Glue stick or glue
- Pan, water, and a flashlight (optional)

Lesson 2

- Piece of chalk or masking tape
- Stopwatch or timer
- 2 pennies
- Scissors
- Glue stick or glue

Lesson 3

- 7 pennies or pebbles per child
- 12 marshmallows per child (regular- or mini-sized) or small balls of play dough
- 12 toothpicks per child
- 1 empty paper towel tube per child (optional)
- 1 piece of black tissue paper per child (optional)
- 1 safety pin or pushpin (optional)
- Black or dark blue paint (optional)
- Paintbrush (optional)
- 1 rubber band for each child (optional)
- Small star stickers (optional)

Lesson 4

- 1 foam or paper cup per child
- 1 pencil per child
- 1 roll of toilet paper
- 9 small objects, such as pebbles or pennies
- 1 medium-sized object, such as a tennis ball or rock

Lesson 5

- "Getting To Know the Planets Cards"—located in the student journals
- Planet Cards Set #1
- 1 coin per child
- 1 sandwich-sized plastic storage bag

Lesson 6

- 1 red and 1 blue colored pencil, marker, or crayon per child
- 2 c Kinetic Sand® or 2 balls of play dough (same color)
- Small pebbles or rocks
- 1 round metal cake pan or pie tin
- Plastic wrap
- Glue stick or glue
- "Getting To Know the Planets Cards"—located in the student journals

Lesson 7

- Glue stick or glue
- 8 OREO® cookies or similar chocolate cookies with white filling per child (or substitute with black and white play dough)
- Red and blue crayons or colored pencils
- Butter knife (optional)
- Lamp, basketball, and tennis ball (optional for extension)
- Scissors

Lesson 8

- 1 Hula Hoop® or 2 pool noodles taped together into a circle
- Pillow (any size)
- Scissors

SUPPLIES NEEDED
CONTINUED

Lesson 9

- Glue stick or glue

Lesson 10

- ½ c milk (any kind)
- Red and yellow food coloring
- Dish soap
- Small bowl
- "Getting To Know the Planets Cards"—located in the student journals
- Planet Cards Set #1

Lesson 11

- Play dough (any colors)
- 1-tsp and 1-Tbsp measuring spoons
- Red, blue, and green food coloring (optional)
- 2 c shaving cream (foam, not gel) (optional)
- 1 c white glue (optional)
- 3 disposable bowls (optional)
- "Getting To Know the Planets Cards"—located in the student journals

Lesson 12

- 1 plastic sheet protector per child (optional)
- Dry-erase marker or other writing utensil per child (optional)
- Scissors
- Glue stick or glue

Lesson 13

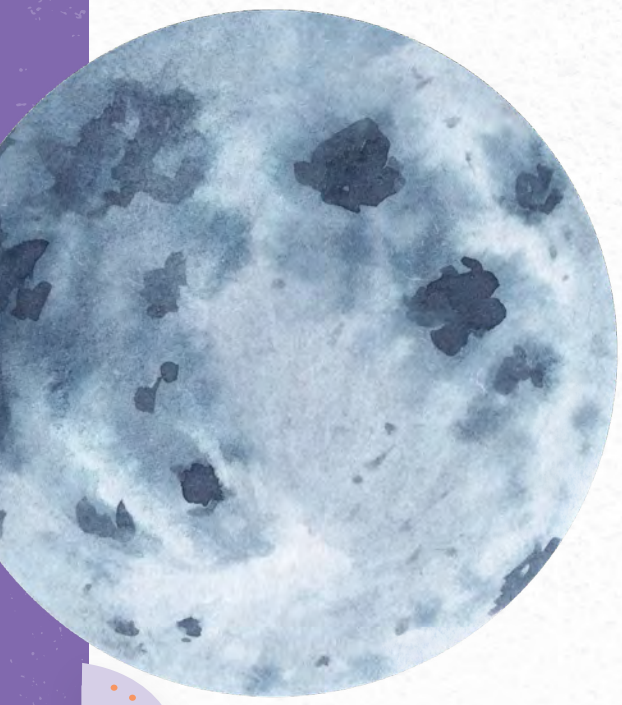
- None

Lesson 14

- Timer (optional)

Lesson 15

- 6-sided die
- Small objects to use as game tokens, such as pennies or pebbles; 1 per child







VOCABULARY

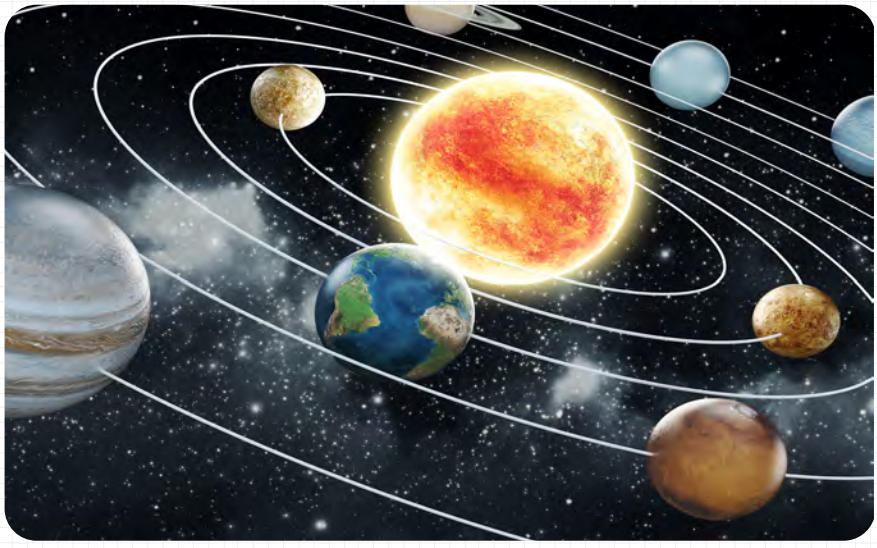
Instructions: Cut out the vocabulary cards in this section. Place them on your science wall when prompted to do so in the lessons. Review the vocabulary words several times during this unit and, if desired, at various times throughout the school year.

Planet



a round body that orbits a star. A planet may have a rocky surface or be made of gases.

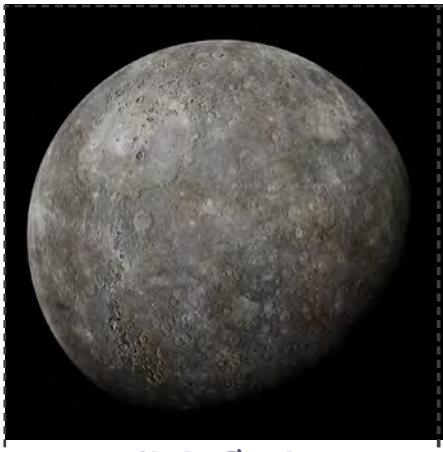
Solar System



the sun and all the planets, asteroids, moons, and other objects that revolve around it

Planet Cards Set #1

Cut out the cards on this page and store them in a zipper bag. You will be prompted to use the cards in several lessons to help the children memorize the planets of the solar system in the order of their proximity to the sun.



MERCURY



VENUS



EARTH



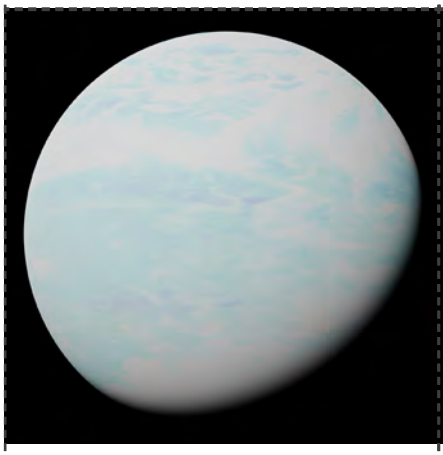
MARS



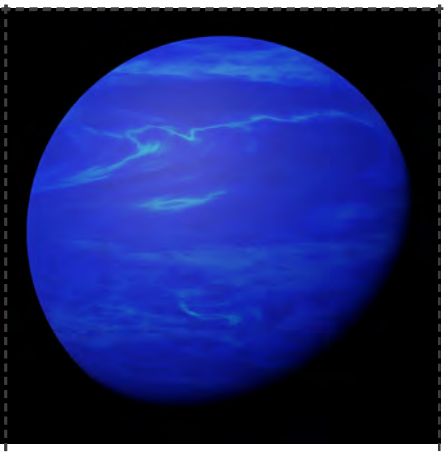
JUPITER



SATURN



URANUS



NEPTUNE

Planet Cards Set #2

Cut out the cards and store them in a zipper bag. You will be prompted to use the cards in several lessons to help the children match the names of the planets to the correct images.



SPACE SCIENCE
LESSON 1

INTRODUCTION TO SPACE

Objective

Help the children feel the wonder of the universe that God created and understand the basic terminology of space science.



Preparation:

- ☐ Cut out "Universe Organization Cards" and tape them onto plastic bags. Tape the "Solar System" picture to a snack-sized plastic bag, the "Galaxy" picture to a sandwich-sized bag, and the "Universe" picture to a gallon-sized bag.
- ☐ Cut out the "Planet Cards Set #1," found after the vocabulary cards in the front of this unit.

Activity Supplies:

- 4 plastic storage bags of varying sizes: one snack size, two sandwich size, one gallon size
- 1 small ball that will fit in the smallest plastic bag
- 6-sided die
- Glue stick or glue
- Pan, water, and a flashlight (optional)

☐ Introduction to Space Video



Watch the "Introduction to Space" video at goodandbeautiful.com/sciencevideos or on the Good and Beautiful Homeschool app.

Read to the children: In this unit we are going to explore the great wonder and vastness of space. God created all the bright stars we can see in the night sky, the bountiful earth we live on, and a multitude of other galactic marvels. From the tiny ladybug to the massive galaxy, all are creations of God.





☐ Hubble Space Photograph

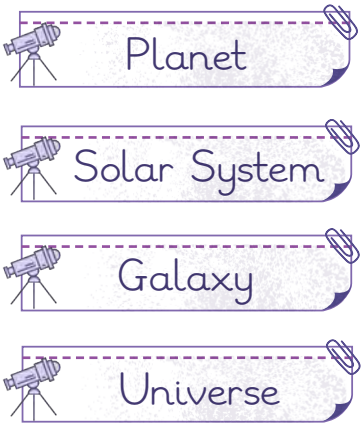
Have the children observe the photo included in this lesson titled "A Photograph Captured by the Hubble Space Telescope." Discuss the grandeur of God, who can create such majestic things.

Have the children observe the photo included in this lesson titled "Rose." Discuss the grandeur of God that is displayed in something as tiny as this spider inside the delicate, velvety, perfumed petals of a single rose.

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Science Wall: Vocabulary Words

Place the vocabulary cards PLANET, SOLAR SYSTEM, GALAXY, and UNIVERSE on your science wall. Read and discuss the words and definitions.





Universe Organization Activity

Give the children the small ball. Read to the children: This ball represents a ***planet.*** A planet is a round body that orbits a star. Planets may be rocky, like our earth, or they may be made of gases, like Jupiter.

Give the children the snack-sized bag with the picture of the solar system on it. Have them put the ball inside the bag. Read to the children: Planets are part of a solar system. Our ***solar system*** is the sun and all the planets, asteroids, moons, and other objects that revolve around it. Look at the illustration on the vocabulary card titled "Solar System" to answer these questions:

1. What is the center of our solar system? [the sun]
2. How many planets revolve around the sun, and what are their names? [There are eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.]

All the planets except for Mercury and Venus have at least one moon.

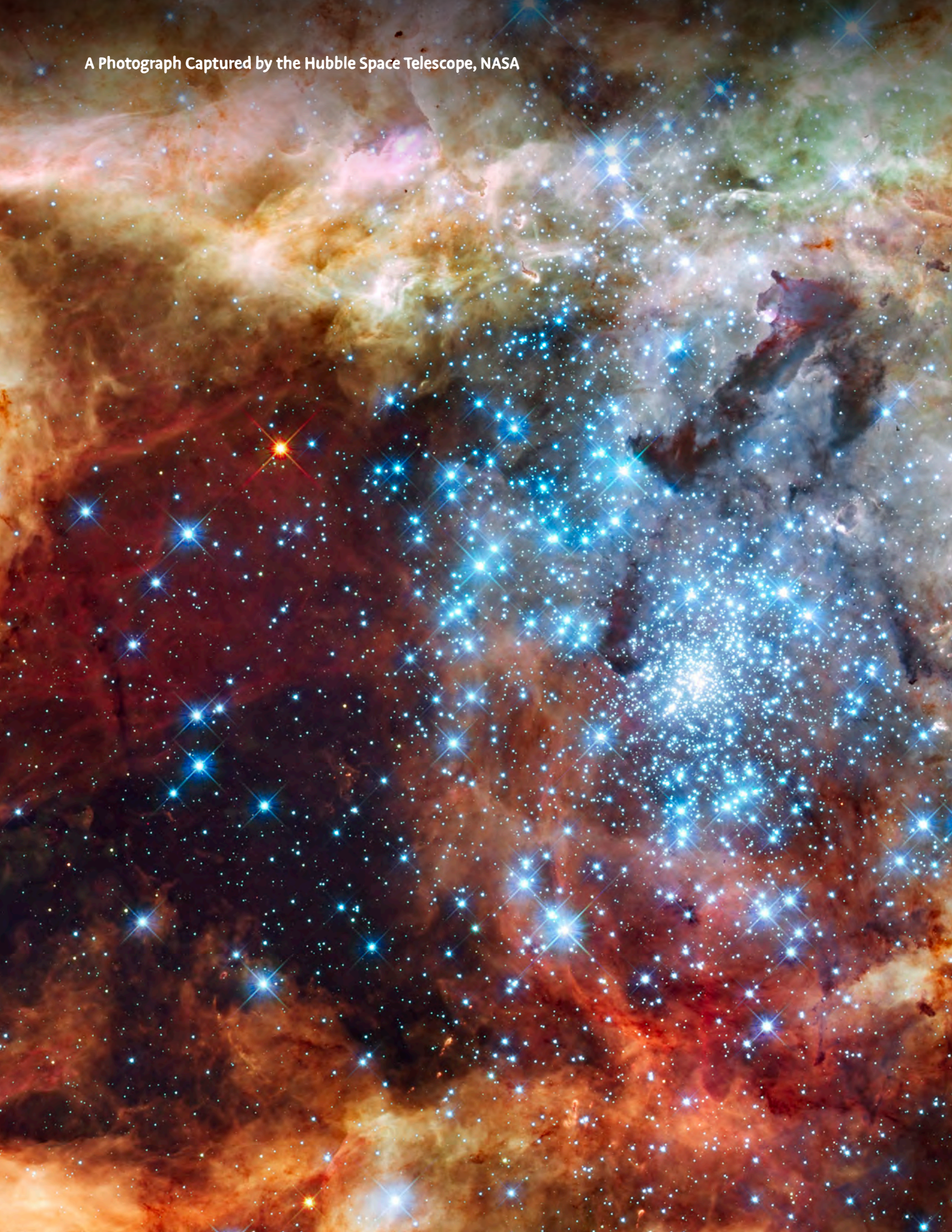
Give the children the sandwich bag with the picture of a galaxy on it. Have the children put the smaller bag inside the larger one. Read to the children: Scientists used to think that there was just one huge group of stars. In 1924 scientists realized that there were actually many large groups of stars. Each group became known as a ***galaxy***.

A galaxy may contain many solar systems. Galaxies are systems of stars, gas, dust, and other matter held together by gravity. Scientists think there are billions of galaxies of all shapes and sizes in the universe.

Give the children the gallon-sized bag with the picture of the universe on it. Have the children put the smaller bags inside the larger one. Read to the children: All the galaxies make up the ***universe***. The universe is everything that exists: animals, people, planets, stars, and galaxies.

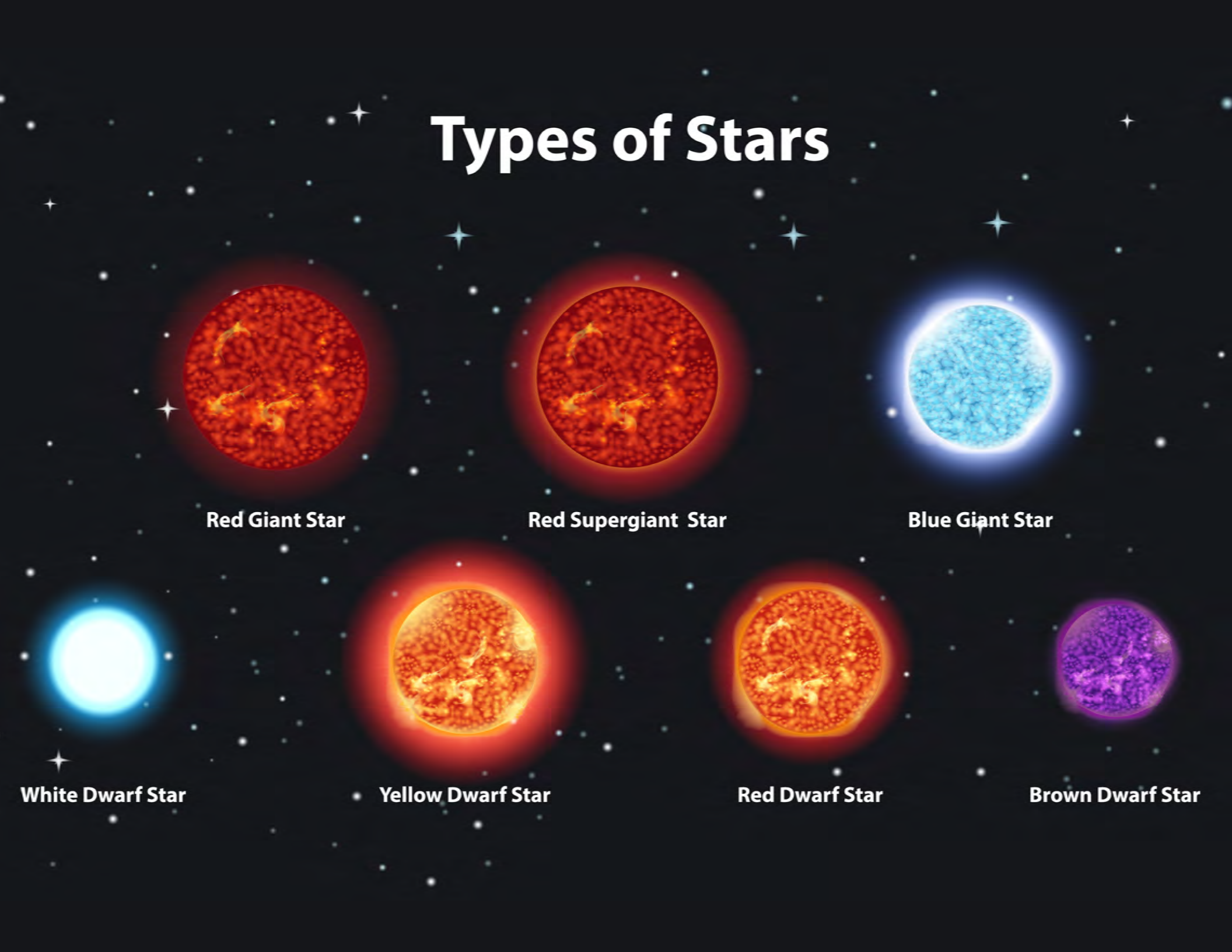


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A Photograph Captured by the Hubble Space Telescope, NASA

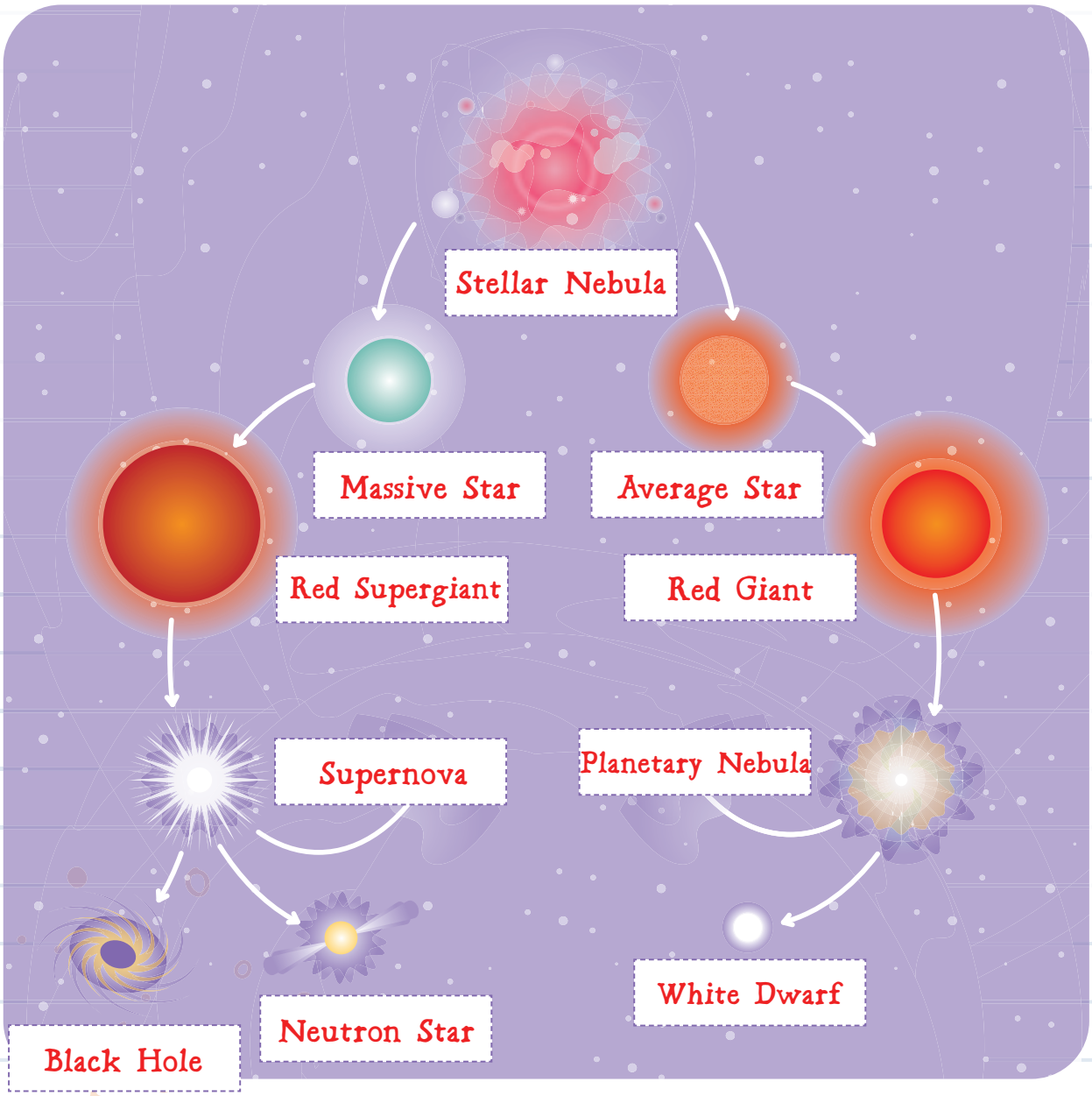
Types of Stars



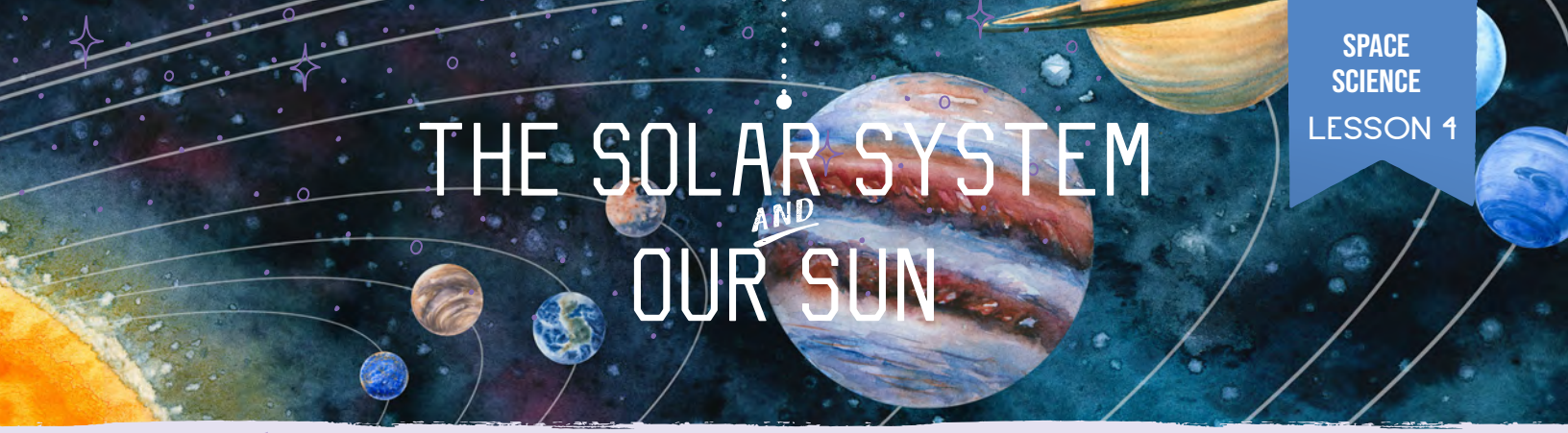
Lesson 2

LIFE CYCLE OF STARS KEY

Cut out the name strips (on the next page), and glue them in the correct places on the life cycle chart below.



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SPACE SCIENCE
LESSON 1

THE SOLAR SYSTEM AND OUR SUN

Objective

Help the children gain a general overview of and appreciation for the solar system, including our sun.



Preparation:

- [ ] None

Activity Supplies:

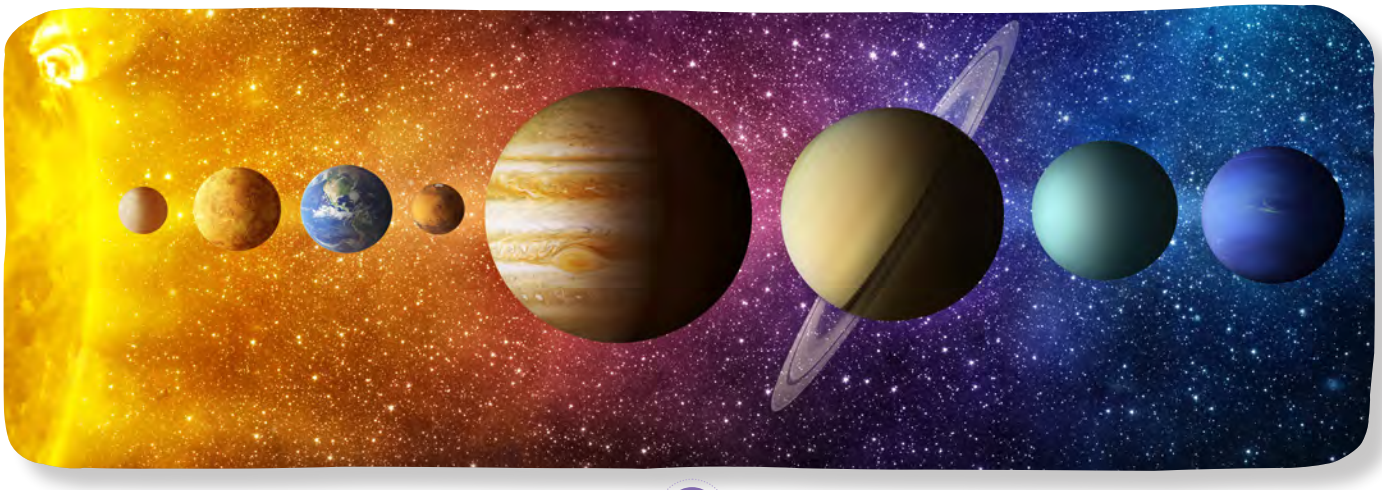
- 1 foam or paper cup per child
- 1 pencil per child
- 1 roll of toilet paper
- 9 small objects, such as pebbles or pennies
- 1 medium-sized object, such as a tennis ball or rock

The Solar System

Read to the children: What contains one star, eight major planets, over two hundred moons, hundreds of thousands of asteroids, and billions of comets? [our solar system]

Hundreds of years ago, most people believed the earth stood still and the sun, moon, and stars all orbited around the earth. A scientist named Copernicus was the first man to promote the idea that the sun is in the center of a system of planets that circle around it, not the earth. He was right! Gravity pulls the planets in a circular path, known as an ***orbit***, around the sun. Think of a ball tied to a string attached to a pole. If you swing the ball, it will circle the pole. All planets in our solar system orbit the sun. The time it takes for a planet to go all the way around the sun makes a year on that planet.

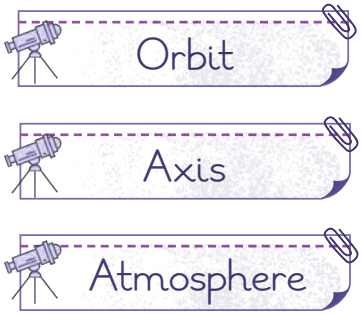
Planets also spin like a top around an imaginary line called an ***axis***. The time it takes for the planet to turn completely around on its axis makes a day on that planet. Some planets have very short days, and some have very long days.



Each planet is unique, but there are some similarities. A few planets, including our own, have ***atmospheres*** composed of layers of gas surrounding them. Moons or other small round bodies can be seen orbiting a number of planets, such as Earth and Jupiter. Beautiful rings made of small pieces of rock or ice orbit some planets, including Saturn and Uranus.

Science Wall: Vocabulary Words

Review the card SOLAR SYSTEM, which you put on your science wall previously. Place the vocabulary cards ORBIT, AXIS, and ATMOSPHERE on your science wall. Read and discuss the words and definitions.



Orbiting the Sun

Read to the children: The orbital path of each of the planets varies, but each planet stays on its own path as it travels around the sun. In the early 1500s, astronomer Copernicus proposed that the planets move around the sun in a circle. Almost 100 years later, in 1601, Johannes Kepler correctly theorized that planets orbit the sun in ellipses, or ovals, not circles. The time it takes for a planet to go around the sun one time is called its planet year. The farther a planet is from the sun, the longer it takes to complete its orbit.

Have the children turn to the "Orbiting the Sun" page in Lesson 4 of their student journals and complete the page.

Order of the Planets

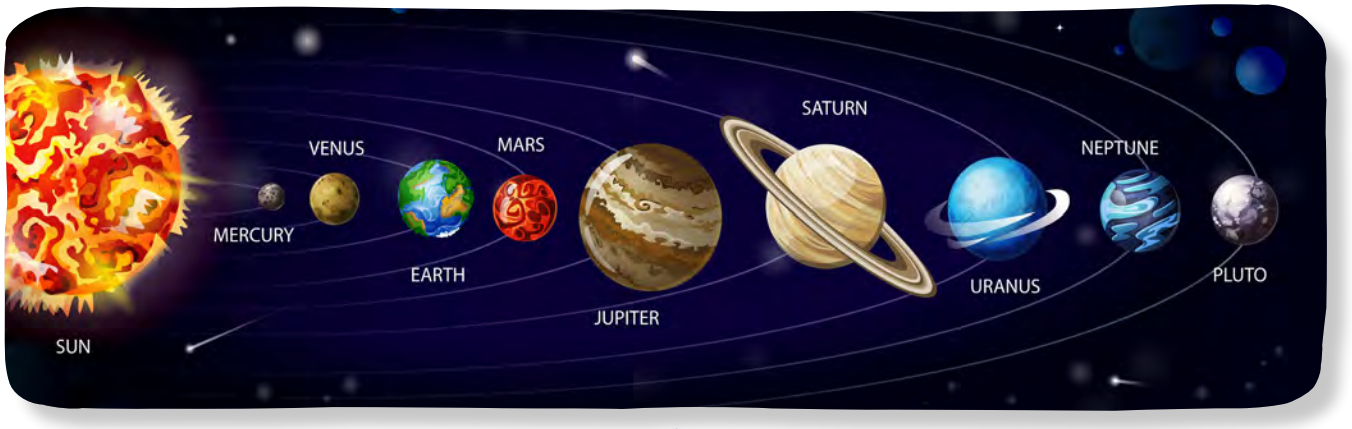
Have the children use the concepts they just learned and the picture at the bottom of this page to answer the following questions:

1. Which planets are closer to the sun than Earth? [Mercury and Venus]
2. Which planet orbits the sun faster—Venus or Earth? [Venus. The closer a planet is to the sun, the faster it moves.]
3. Which planet takes more time to orbit once around the sun—Saturn or Neptune? [Neptune. The farther a planet is from the sun, the longer its orbit is.]

Classifying a Planet

Read to the children: Rocketing through space in orbits around the sun are a variety of objects in addition to planets. These include asteroids, comets, meteoroids, and even dwarf planets. Out of all of these objects, how did astronomers decide what could be called a planet?

The definition of what a planet is has changed over time. In 2006 the International Astronomical Union—a group of scientists from around the world—decided on a new definition. They said that a planet must be



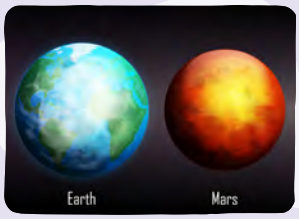
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SPACE SCIENCE
LESSON 6

TERRESTRIAL PLANETS: EARTH AND MARS

Objective

Help the children explore some of the characteristics of Earth and Mars.



Preparation:

- ☐ None

Activity Supplies:

- 1 red and 1 blue colored pencil, marker, or crayon per child
- 2 c Kinetic Sand® or 2 balls of play dough (same color)
- Small pebbles or rocks
- 1 round metal cake pan or pie tin
- Plastic wrap
- Glue stick or glue
- "Getting to Know the Planets Cards"—located in the student journals

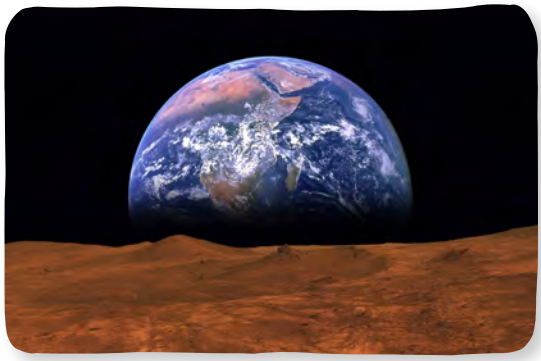
☐ Optional Read Aloud

At any point in the lesson, you may read *Mars Exploration: 1960–2016* by Megan Noel, available in the optional read-aloud book pack for this unit.

☐ Blue Planet, Red Planet Journal Activity

Read to the children: People often refer to our planet, the earth, as the Blue Planet because it is covered in water. Do you know which planet is called the Red Planet? Mars is called the Red Planet because its surface is covered with rusty rocks—rocks with a lot of iron oxide in them. Mars has been studied more than any other planet in our solar system except for Earth. Both Earth and Mars are terrestrial planets.

Have the children turn to the "Blue or Red Planet?" page in Lesson 6 of their student journals. Have them follow the directions to complete the activity as you read the following facts about Earth and Mars.



1. Earth is the third planet from the sun and the only known planet with liquid water on its surface. Seventy-one percent of the earth's surface is covered with water.
2. Mars is the fourth planet from the sun. Its rocky surface has extinct volcanoes, polar ice caps, and the highest mountain in the solar system.
3. Earth takes approximately 365 days to orbit the sun and 24 hours to complete a rotation on its axis. Because those numbers aren't exact, we have to make up the difference with leap years and even leap seconds to keep our clocks correct.

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Now remove the rocks from the play dough or Kinetic Sand® and smooth out the craters. Place a layer of plastic wrap tightly across the top of the cake pan or pie tin.



When rocks come near Earth, the atmosphere protects it, and most meteoroids burn up before ever striking the surface. What do you think will happen if you drop rocks onto the surface now? **Have the children toss the small pebbles or rocks onto the pan or tin and observe how the plastic wrap blocks the meteorites from hitting the surface or slows them down before they can hit the surface.**

Challenges of Living on Mars

Read to the children: Living on Mars would be difficult. How would it be different from living on Earth? **Have the children turn to the "Challenges of Life on Mars" page in their student journals. Discuss some of the problems listed below. As you discuss each problem, have the children complete the corresponding section on their student journal pages.**

- **There is very little oxygen**; humans would need a way to create oxygen and use it to breathe.
- Mars has a very **thin atmosphere** and is not as well protected from the sun's radiation as the earth.
- There is **no food or water** on Mars.
- The **temperature** on Mars gets much colder than on Earth. The average temperature is −60 °C (−81 °F). A summer day may be as warm as 20 °C (68 °F), but at night the temperature can plummet to −73 °C (−100°F). At the poles it can be as cold as −125 °C (−195 °F).
- Scientists estimate that Mars gets hit by around 200 rocks, or **meteorites**, every year. This could cause big problems for people living on the planet.
- It takes a long time to get to Mars because it is very **far from Earth**. It takes an unpiloted spacecraft at least five months to get to Mars. No person has ever been to Mars.

Show the children the "Life on Mars" page found at the end of this lesson. Read to the children: Look at the pictures on the "Life on Mars" page, which show how different artists think life might look on Mars in the distant future. **Have the children draw what they believe a space station might look like on Mars on the student journal page.**

Getting to Know the Planets Cards

Provide the children with the "Getting to Know the Planets Cards," found at the end of each child's student journal. Have the children complete the Earth and Mars cards, using the information from the lesson. The other cards will be completed in future lessons.

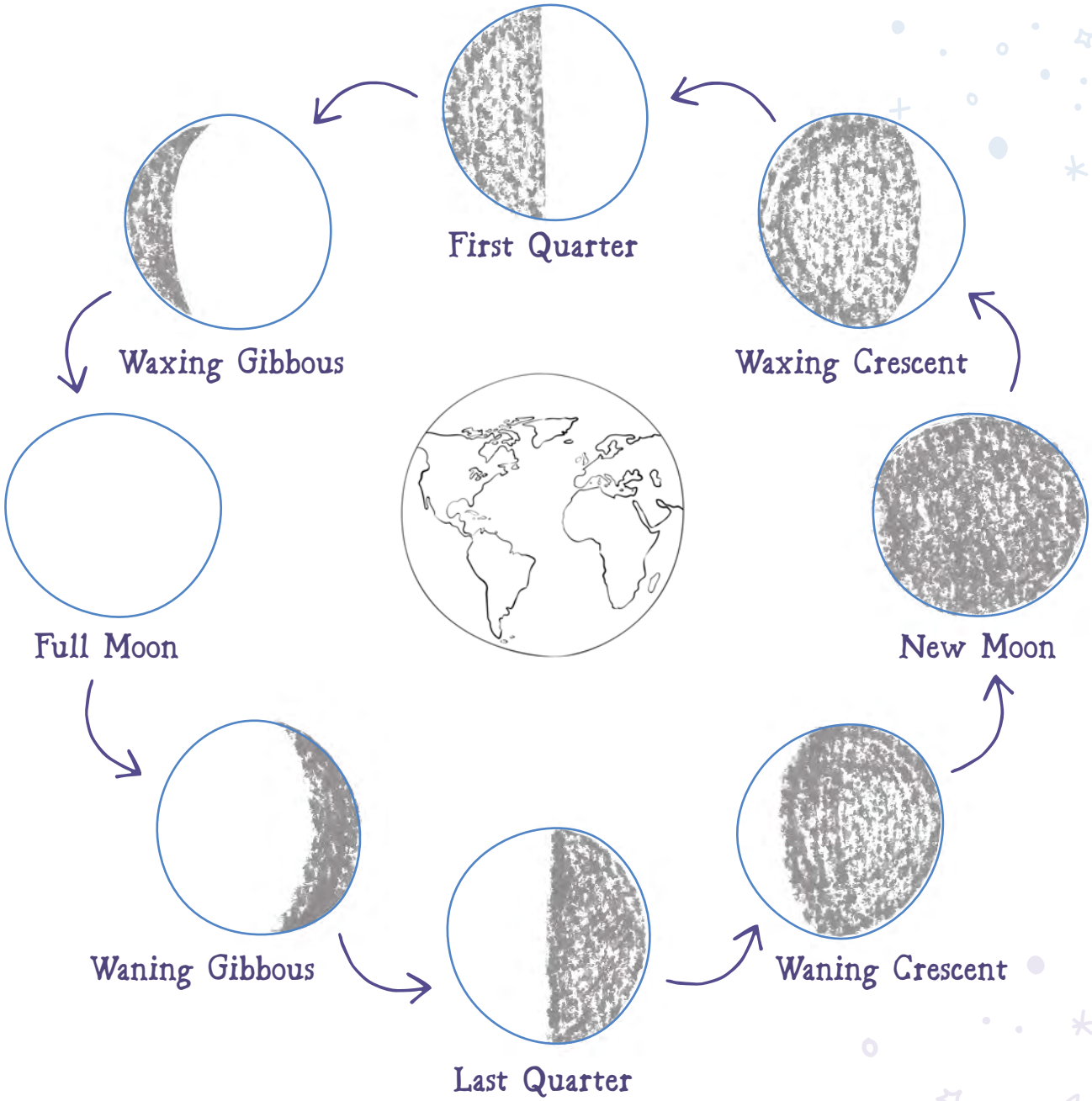


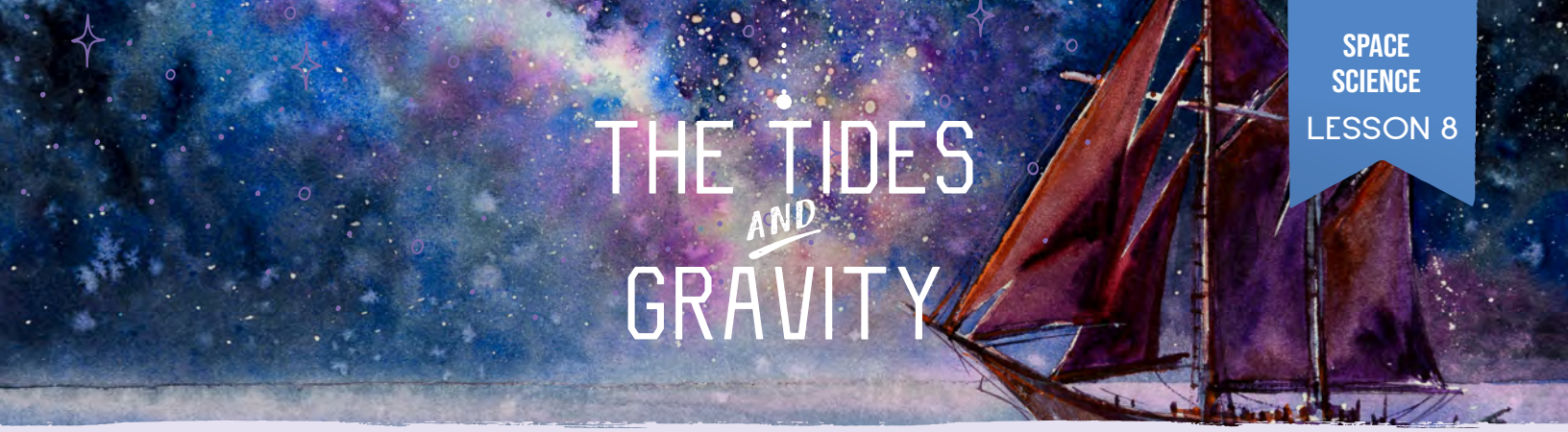
Lesson 6 Extension

7–8

Have children grades 7–8 complete the self-directed Lesson 6 extension titled "Our Favorite Martians" in their student journals.

MOON PHASES CHART





SPACE SCIENCE
LESSON 8

THE TIDES AND GRAVITY

Objective

Help the children understand tides and what causes them. Help the children understand what gravity is in relation to space science.



Preparation:

- ☐ Cut out the "What Would You Weigh?" cards for children grades 3–6 in the 3–6 student journal.

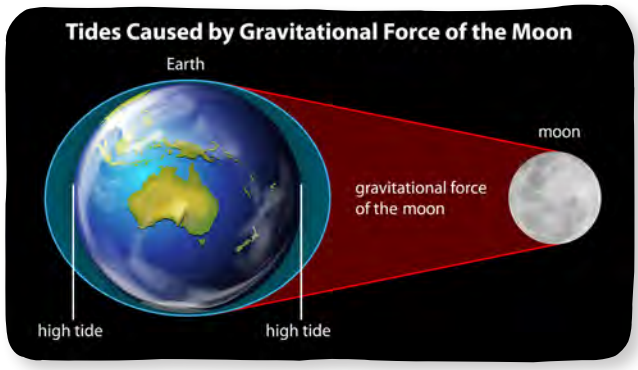
Activity Supplies:

- 1 Hula-Hoop® or 2 pool noodles taped together into a circle
- Pillow (any size)
- Scissors

☐ Introduction to Tides

Read to the children: Imagine you are at the beach making a big sandcastle. You start to notice that the water is getting closer and closer to your sandcastle until the waves finally crash into it. What happened? Why do waves go higher up the beach at different times of day? Would you believe it has to do with the moon and sun? It does! *Tides* are the twice-daily swelling and ebbing of the oceans.

As we learned in the last lesson, the moon orbits the earth. As it moves around the earth, gravity from the moon pulls water in the moon's direction. Typically, water will rise for about six hours and then fall back down for six hours.





☐ Tides Activity

Have one child stand holding the Hula-Hoop® (or pool noodles) around his or her waist. Have yourself or another child stand facing him or her and pull gently on the Hula-Hoop®.

Read to the children: When the moon pulls on the earth, it pulls the water toward it. This pull causes a high tide on the side of the earth facing the moon. When the Hula-Hoop® was pulled, did you feel yourself move slightly too? The moon also pulls the earth slightly toward it. That is why the far side of the earth also has a high tide at the same time as the side closest to the moon. The water on the far side of the earth is also the least affected by the moon's gravity, so it bulges out. Low tides occur on the parts of the earth that are not lined up with the moon. **Give each of the other children a turn being the earth (holding the**

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SPACE SCIENCE
LESSON 10

THE GAS GIANTS: JUPITER AND SATURN

Objective

Help the children explore the characteristics of Jupiter and Saturn.



Preparation:

- ☐ Remove the pages "Jupiter" and "Saturn" from the end of this lesson and cut out the "Fact Cards."

Activity Supplies:

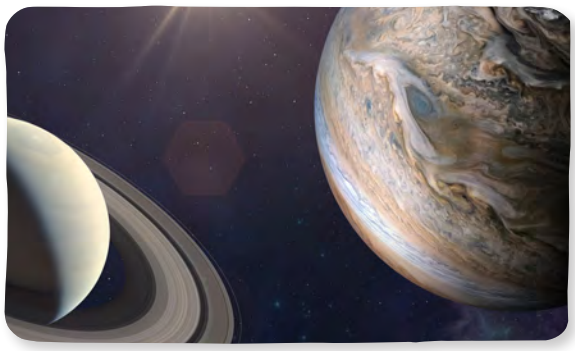
- ½ c milk (any kind)
- Red and yellow food coloring
- Dish soap
- Small bowl
- "Getting to Know the Planets Cards"—located in the student journals
- Planet Cards Set #1

☐ Introduction and Review Activity

Lay out the "Planet Cards Set #1" saved from Lesson 1 in front of the children. Have the children select the correct card as you ask each question. Which planet is closest to the sun? [Mercury] Which planet is the hottest because of its thick atmosphere? [Venus] Which planet is the only one with liquid water? [Earth] Which planet is called the Red Planet? [Mars] These are the four planets that are closest to the sun. Do you remember what we call these four planets? [inner planets, rocky planets, or terrestrial planets] After the planet Mars is a region where we find most of the asteroids in our solar system. Do you remember what that area is called? [the asteroid belt]

Have the children place the cards for Jupiter, Saturn, Uranus, and Neptune in order. Because Jupiter, Saturn, Uranus, and Neptune lie outside the asteroid belt, they are known as the outer planets. They are also called *gas giants* because they are mostly made of gas, and they are massive in size compared to the other four planets. These four planets farthest from the sun account for 99% of the total mass of all celestial bodies that orbit the sun. Because of their distance from the sun, each of these planets is colder than Earth.

Turn the Planet Cards facedown and practice saying the planets in order. You can remind the children of the mnemonic device: My Very Enthusiastic Mother Just Served Us Noodles.



☐ Jupiter and Saturn Moon Match Activity

Lay the pages "Jupiter" and "Saturn" in front of the children. Lay out the cut-out "Fact Cards" with the moon images facing up. Read to the children: Did you know that Jupiter and Saturn have at least 79 and 82 moons

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respectively? These cards have the four biggest moons of each planet on them. We're going to learn about these two planets as we place their moons in orbit around them. **Have the children take turns choosing a moon card and reading the planet fact on the back. Have them place the card next to the picture of the correct planet.**

Swirling Clouds of Gas

Read to the children: Despite their name, gas giants are not composed completely of gas and do have a core of liquid metal and rock. However, they are most well-known for their beautiful swirling clouds, as shown in the picture below. These swirling clouds are constantly in motion, which is easy to see with the various colors. Look at the stripes on Jupiter in the picture below. What do you think causes these different colors?



Swirling clouds of Jupiter

The different colors are caused by different chemicals in the gas. For example, Neptune, a gas giant we will explore in the next lesson, has a greenish-blue hue that is a result of the methane gas found in its atmosphere.



Scientists believe Jupiter's reddish-orange color is a result of the chemicals ammonia and acetylene. Also, lighter-colored bands exist where gas in the atmosphere is rising upwards, and darker bands exist where gases are drifting downwards.
As the planet spins and winds whip the gaseous atmosphere, the bands of color twist and twirl. We are going to recreate this ourselves in the next activity.

Jupiter Storm Activity

This activity can be done as a group or with a single child. Help the children complete the steps below.

1. Pour ½ c milk into a small bowl.
2. Add one drop of yellow food coloring and one drop of red food coloring.
3. Put a drop of dish soap in the middle of each color.
4. Pick up the bowl and gently swirl it around a few times, and you have something that looks like a storm on Jupiter!



Getting to Know the Planets Cards

Provide the children with the "Getting to Know the Planets Cards," found at the end of each child's student journal. Have the children complete the Jupiter and Saturn cards, using the information from the lesson. The other cards will be completed in future lessons.

Lesson 10 Extension

7–8

Have children grades 7–8 complete the self-directed Lesson 10 extension titled "Icy Eruptions" in their student journals.

FIRST MAN IN SPACE

April 12, 1961

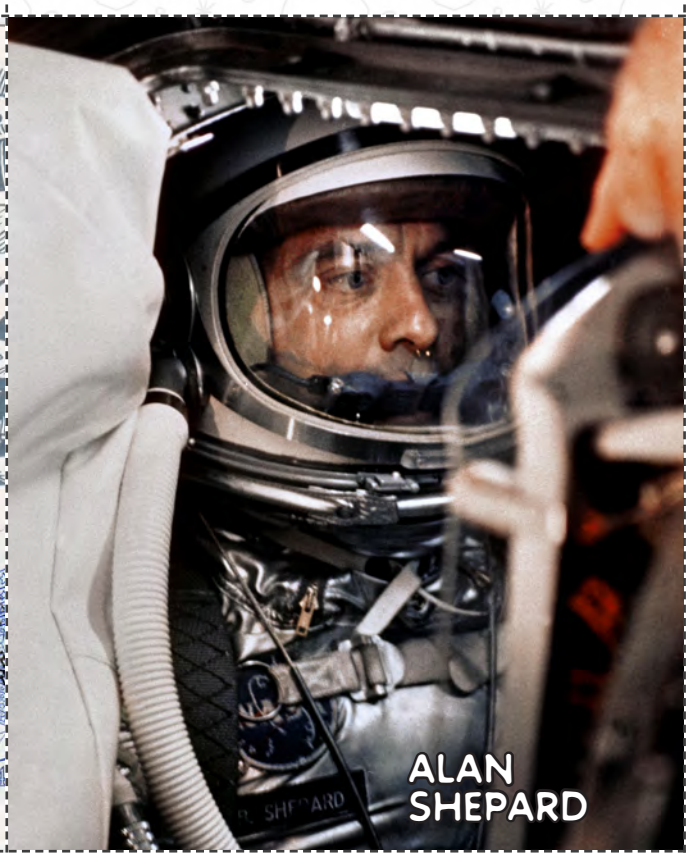
Yuri Gagarin, from the Soviet Union, was launched into space aboard the *Vostok I* spacecraft. He completed one orbit around the earth before reentering the earth's atmosphere, ejecting from the spacecraft, and landing by parachute in Kazakhstan near the Volga River.



FIRST AMERICAN IN SPACE

May 5, 1961

Alan Shepard became the first American to launch into space aboard the *Freedom 7*. His flight was successful, and he splash-landed in the Atlantic Ocean.



SPACE EXPLORATION PART 1: THE PAST

Objective

Help the children understand how humanity has met some of the challenges of space exploration as we have begun to explore the universe.



Preparation:

- ☐ Cut out the "Living on the International Space Station" pictures.
- ☐ Place the cut-out "Living on the International Space Station" pictures throughout the room.
- ☐ Take the "ISS Facts" sheet out of the course book.

Activity Supplies:

- Timer (optional)

☐ Blastoff!

Read to the children: Have you ever heard the phrase, "3, 2, 1, blastoff!"? When we think of rockets launching into the sky, these might be the words that come to mind. But the countdown clock for a space launch actually starts 43 hours before the launch, and those 43 hours are busy with safety checks, weather updates, and systems activations. As the clock ticks down, an astronaut gets ready to take an adventure unlike any other. What do you think it would be like to travel into space? Would you ever want to travel into space? Why or why not?





Show the children the image to the right. In early space missions by the Apollo program, astronauts were crammed into a tiny capsule and launched into space atop a powerful rocket. These missions demonstrated that people could travel into space, perform useful tasks there, and return safely to Earth. With every launch, scientists and engineers developed better and better technology to make space more accessible until finally, on April 12, 1981, the first *space shuttle* took off.

☐ Parts of a Space Shuttle



Turn to the "Parts of a Space Shuttle Key" and have the children point to each space shuttle part every time you say its name.

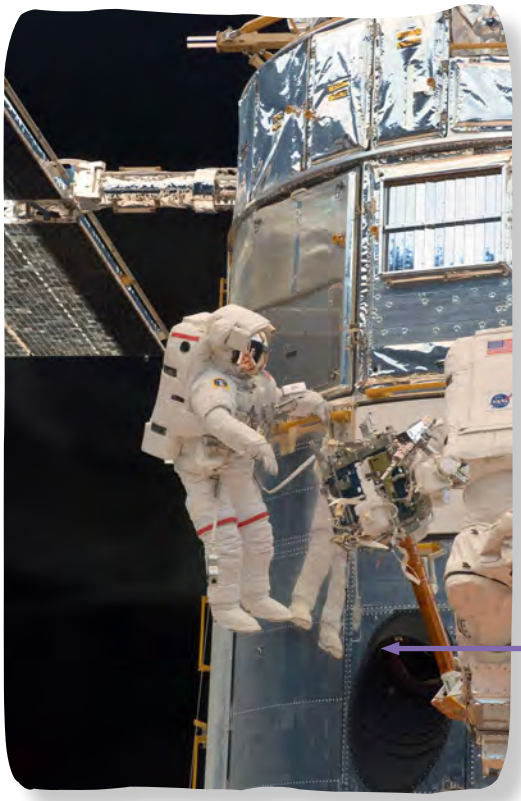
Read to the children: Would you rather go into space in the Apollo rocket above or the space shuttle? Space shuttles were not only the first partially reusable spacecraft, but they were much easier to navigate, more comfortable, and able to transport more material.

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These amazing aircraft require a lot of power and fuel! The shuttle itself, also called an *orbiter,* had three *main engines* that burned liquid hydrogen and liquid oxygen. The *vertical stabilizer* acted like a rudder on a boat, allowing the shuttle to turn left or right. To provide enough fuel, the shuttle was strapped to a large *external tank*. **Show them the orange tank in the image on the previous page.** To help the space shuttle get off the ground, two *solid rocket boosters* were attached to the fuel tank. When their fuel was used up, the boosters separated from the main fuel tank, and the shuttle flew the rest of the way to space using its own engines. Once in space, the external tank was ejected and burned up as it fell back into the atmosphere. The solid rocket boosters splashed down in the ocean and were recovered and reused. When the space shuttle's mission was complete, it reentered Earth's atmosphere and landed on a runway, just like an airplane.



COLUMBIA SPACE SHUTTLE



Have the children turn to the "Parts of a Space Shuttle" page in Lesson 14 of their student journals and complete the page. If desired, have the children try to complete the page before a timer goes off, just like each part of a space shuttle must be checked before launch.

The first space shuttle built was named *Enterprise* after the spaceship in the TV show *Star Trek*. This was a prototype used for testing and never actually flew in space. The following five shuttles did fly into space: *Columbia*, *Challenger*, *Discovery*, *Atlantis*, and *Endeavor*. Over their lifetimes they flew a total of 135 missions in space, carrying satellites and scientific instruments like the Hubble Space Telescope into orbit. Shuttle astronauts also made repairs to satellites and, when necessary, brought them back to Earth. They also performed countless scientific experiments in space.

REPAIRING HUBBLE SPACE TELESCOPE



The last American shuttle flew in 2011. NASA's space shuttle program was shut down for a variety of reasons, including lack of funding. To continue to contribute to the building of the International Space Station, American astronauts flew on Soviet shuttles to the space station. In 2020 the private company SpaceX launched astronauts to the space station from American soil.

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ISS Facts Tour

Read to the children: Space shuttles carried components of the International Space Station into space, where shuttle astronauts helped construct it. This amazing outer-space laboratory is the only place where experiments can be conducted under unique conditions, such as zero gravity. There are facilities on Earth that have reduced gravity to perform experiments, but they are unable to replicate the exact conditions of space. At any given time, there are an average of 200 experiments underway on the ISS. We are going to take a photo tour of the International Space Station to get an idea of what life is like living on board.

Have the children move together from one "Living on the International Space Station" photo to the next, study each image, discuss anything they find interesting, and read a fact about the ISS from the "ISS Facts" page. Discuss the information where applicable. When the children have completed their tour, ask them the following questions:

1. What would you like about living on the ISS?
2. What challenges do you think astronauts face living on board? [lack of gravity, being away from family, having to make all their own repairs, never being able to go outside, etc.]

Lesson 14 Extension

7–8

Have children grades 7–8 complete the self-directed Lesson 14 extension titled "Telescopes" in their student journals.



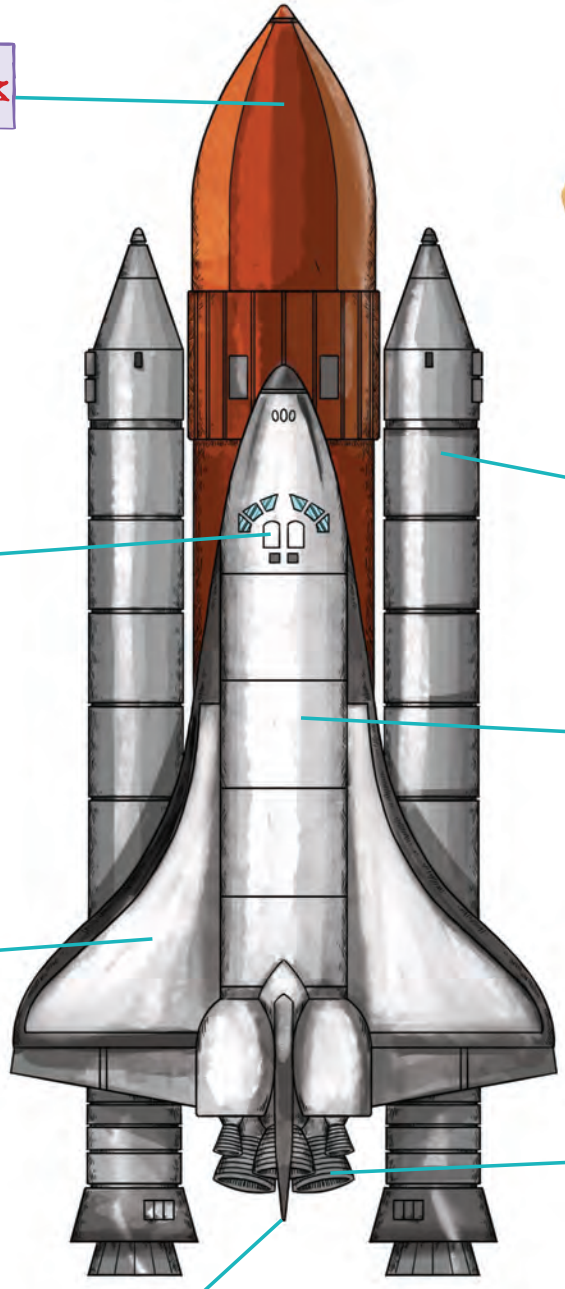
The International Space Station on May 23, 2010, as seen from the departing space shuttle *Atlantis*



Lesson 14

PARTS OF A SPACE SHUTTLE KEY

The Apollo program demonstrated that people could travel into space, perform useful tasks there, and return safely to Earth. But space had to be more accessible. This led to the development of the space shuttle. Label the parts of the space shuttle using the following words: External Tank, Solid Rocket Booster, Crew Cabin, Wing, Orbiter, Main Engines, and Vertical Stabilizer. Color or decorate your space shuttle if desired.



External Tank

Solid Rocket Booster

Crew Cabin

Orbiter

Wing

Main Engines

Vertical Stabilizer

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FUTURE OF SPACE EXPLORATION CARDS

