

Science

Science

Space and Technology

Patterns in the Sky

by Ann J. Jacobs

Genre	Comprehension Skill	Text Features	Science Content
Nonfiction	Sequence	<ul style="list-style-type: none">• Captions• Labels• Diagrams• Glossary	Day and Night Sky

Scott Foresman Science 3.15



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Vocabulary

axis

constellation

lunar eclipse

phase

revolution

rotation

star

telescope

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Patterns in the Sky

by Ann J. Jacobs



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What are some patterns that repeat every day?

The Sun

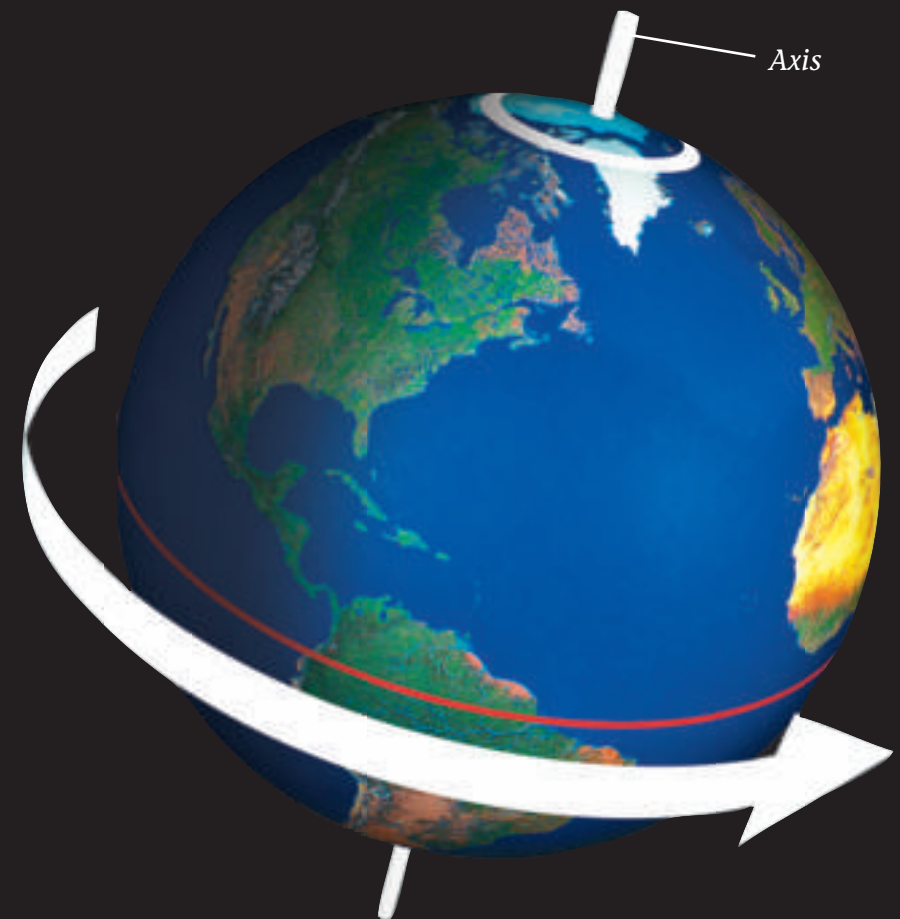
The Sun is always in the sky. You can see it on sunny days. It is there on cloudy days too. The Sun is a star. A **star** is a big ball of hot, glowing gases. Light and heat on Earth's surface come from the Sun.

Earth is small compared to the Sun. But they are both shaped like a ball. Earth does not make its own light. The side of Earth facing the Sun is lit by sunlight. The side of Earth facing away from the Sun is dark.



Day and Night

Earth is moving all the time. It spins around an imaginary line called an **axis**. One end of this line passes through the North Pole. The other end passes through the South Pole. Earth spins on its axis in a counterclockwise direction. This is the opposite direction of the way hands on a clock move.





The Sun is at its highest point in the sky at around noon.

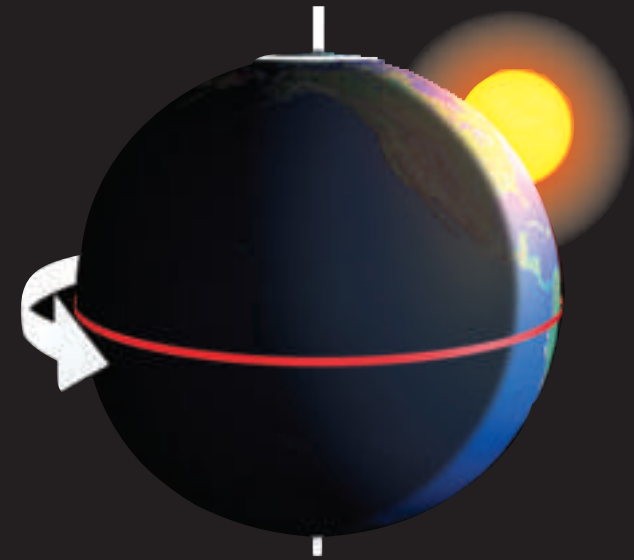


The Sun appears to move lower in the western sky as Earth rotates.



Earth makes one full spin on its axis every 24 hours. This is called a **rotation**. During this time, half of Earth faces the Sun. It is daytime there. The other half of Earth has night.

Earth always rotates at the same speed. During the year, some days have more sunlight than others. The number of hours of sunlight and darkness changes. But the total hours of sunlight and darkness in a day always add up to 24 hours.



Daytime begins when Earth's rotation causes the Sun to appear over the eastern horizon.



The Sun may trick you. It appears to rise in the east. Then the Sun seems to move across the sky and set in the west. But the Sun is not moving at all! It only appears to move. It is really Earth that is moving.





Shadows

Have you ever stood in the shade of a tree? If so, you were really standing in a shadow. A shadow forms when an object blocks the light that hits it. The shadow is cast onto a surface. It is shaped like the object that blocks the light.



The length and direction of shadows change. Find the shadow in the top picture. The Sun appeared in the east. The shadow is long. It stretches in the opposite direction from the Sun. Morning shadows stretch toward the west.

Find the shadow in the middle picture. At noon, the Sun is high in the sky. Shadows are short.

Later in the day, shadows become longer again. Afternoon shadows stretch toward the east. You can see this in the bottom picture.

Once the Sun disappears, there is no light to make shadows.

How do the length and direction of the shadow cast by this basketball hoop change during the day?





What patterns repeat every year?

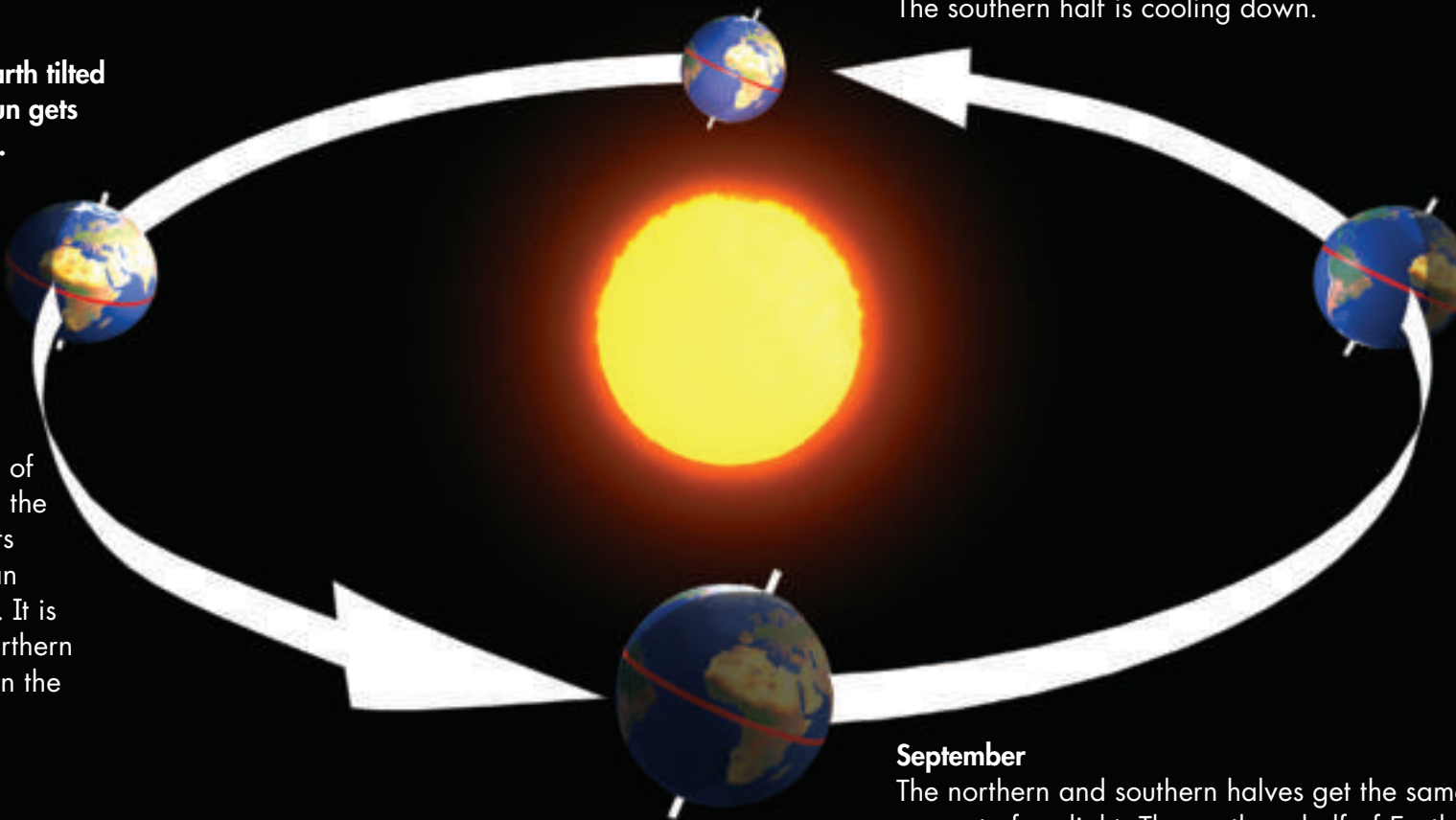
Earth Moves Around the Sun

Earth turns on its axis. Earth's axis is not straight up and down. It is tilted. Earth also moves, or revolves, around the Sun. In one year, Earth moves all the way around the Sun. This trip is called a **revolution**. As Earth moves, its axis always points in the same direction.



The part of Earth tilted toward the Sun gets the most light.

June
The northern half of Earth tilts toward the Sun. This half gets more sunlight than the southern half. It is summer in the northern half. It is winter in the southern half.



Sometimes the northern half of Earth tilts toward the Sun. At other times the southern half tilts toward it. The part tilted toward the Sun gets the most direct sunlight. This part gets the most heat. It also gets more hours of daylight than darkness in a day.

March
The northern and southern halves of Earth get equal amounts of sunlight. The northern half is warming up. The southern half is cooling down.

December
The northern half of Earth tilts away from the Sun. This half gets less sunlight than the southern half. It is winter in the northern half. In the southern half, it is summer.

September
The northern and southern halves get the same amount of sunlight. The northern half of Earth is cooling down. The southern half is warming up.





Seasons

The four seasons are spring, summer, fall, and winter. Which one do you like best?

The amount of sunlight changes from season to season. So do temperatures. These changes happen in patterns. Temperatures are often hot in the summer. In winter, temperatures are usually cold.

Think about December. The northern half of Earth is tilted away from the Sun. This means it gets less sun. Temperatures are cold. There are fewer hours of daylight.



In different seasons, the Sun's place in the sky changes. This is due to Earth's tilted axis. The Sun is higher in the sky in summer. The Sun is lower in the sky in winter.

In spring and fall, Earth's axis is not pointed toward the Sun or away from it. Temperatures are not as cold as winter. But they are not as hot as summer. The hours of daylight and darkness are about the same each day.

Earth's tilted axis causes the Sun's position in the sky to change.

When the Sun is higher in the sky, there are more hours of daylight.

East

West

June

December

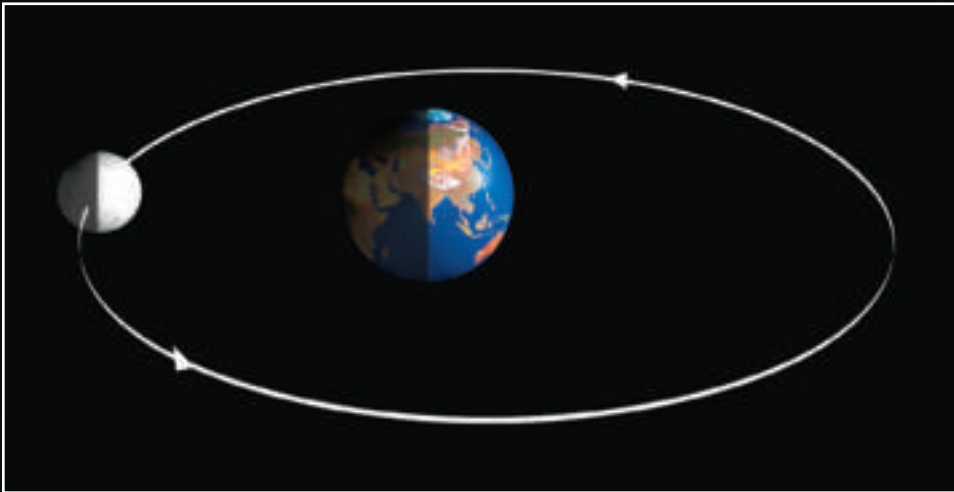
This picture shows how the Sun's position changes on the northern half of Earth.



Why does the Moon's shape change?

The Moon and Earth

The Moon rotates and revolves like Earth. The Moon rotates on its axis. It revolves around Earth. The Moon takes about 27 days to make one rotation. The Moon makes one revolution in almost the same amount of time.



The Moon rotates on its axis and revolves around Earth in about the same amount of time.



The closest natural object to Earth is 384,000 kilometers (239,000 miles) away. It is the Moon. At night, the Moon is very bright. But the Moon does not make its own light. Light from the Sun shines on the Moon and bounces off.

You can see the Moon sometimes during the day. This is because daytime light in the air is less bright.

We always see the same side of the Moon from Earth. No one saw the other side until a spacecraft took pictures of it in 1959!





The Moon and the Sun

Sometimes the Moon looks like a circle. At other times you cannot see the Moon at all. Between these times you can only see part of the Moon. This pattern of changes is the same. It starts over about every four weeks or $29\frac{1}{2}$ days.

Each different way that the Moon looks is called a **phase**. You see more of the Moon each night until the phase called a full Moon. Then you start to see less of the Moon. Soon you cannot see the Moon at all. This phase is called a new Moon.

Half of the Moon is always lighted. We cannot always see this half. We see different amounts of the lighted half as the Moon and Earth move.



Lunar Eclipse

A **lunar eclipse** is caused by the Moon moving behind Earth. When it does, Earth blocks sunlight from reflecting off the Moon. During a lunar eclipse, Earth's shadow covers the whole Moon.



Earth makes a shadow on the Moon during a lunar eclipse.





Phases of the Moon

Full Moon

This phase is a week after the First Quarter. We can see all of the lighted half of the Moon. It looks like a circle.

The inner ring shows how the Moon looks from space.

First Quarter

This phase is a week after the new Moon. The Moon looks like a half circle.

Crescent

This phase is right after the new Moon. Now we see only a small piece of the lighted part of the Moon.

Earth

Light

The outer photos show how the Moon looks from Earth.

Third Quarter

New Moon

The dark half of the Moon faces toward Earth. We cannot see the Moon at all.



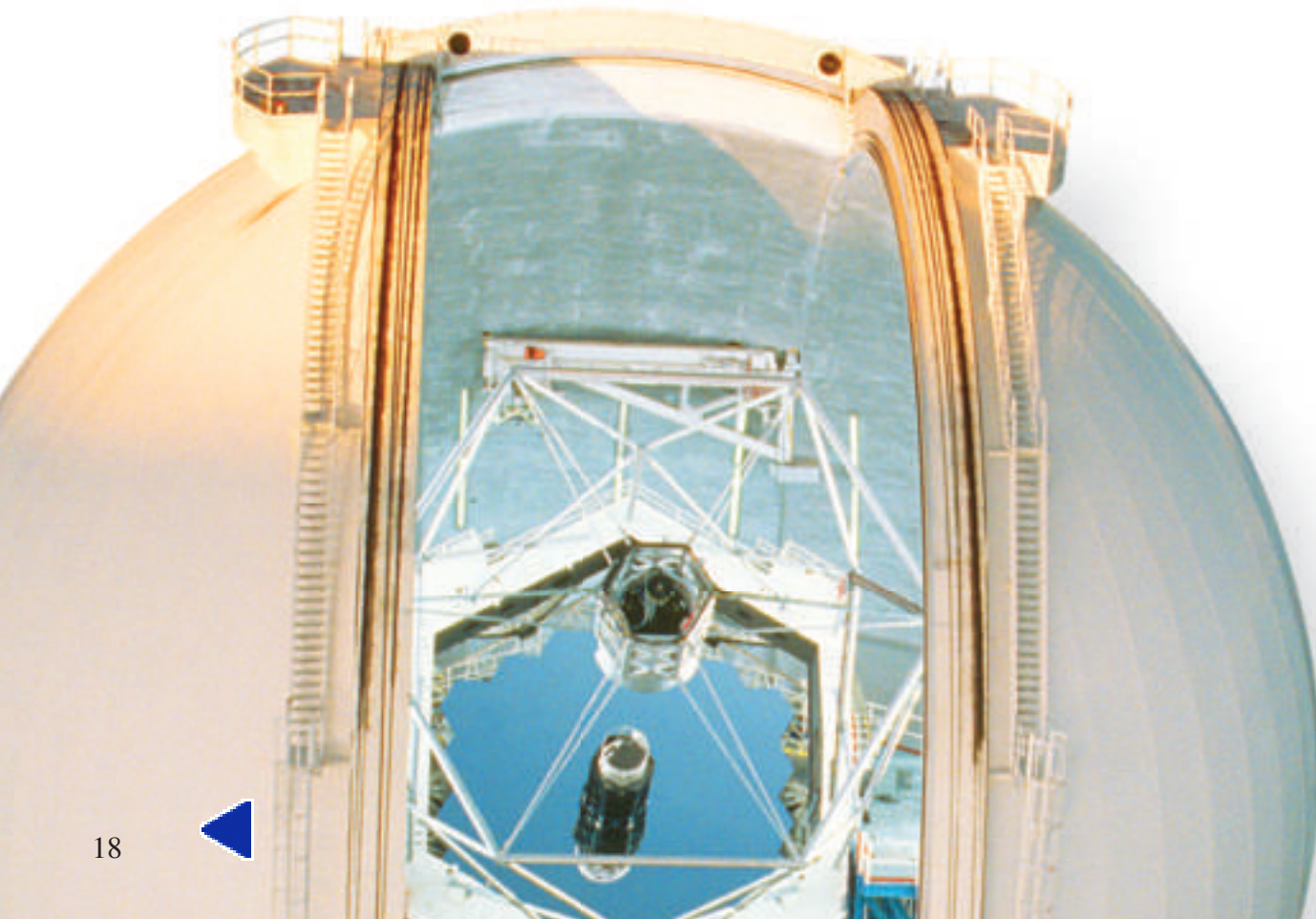


Star Patterns

Stars and the Telescope

Suppose you are looking at the night sky. Do you see stars? Stars may look small. But they are far away. Some stars are bigger than the Sun! Others are smaller. The stars that are very far away can be hard to see. There are tools to help you see these stars.

A **telescope** magnifies faraway objects as binoculars do. Both tools make objects look bigger. Then the objects are easier to see.



There are different kinds of telescopes. Some use tubes, mirrors that reflect light, and lenses that bend light. These parts let lots of light into the telescope. This makes objects in the sky easy to see.

There are even telescopes that do not collect light waves. They collect different waves instead. Some collect radio waves!





Patterns of Stars

Some stars seem to be in groups. These groups make patterns. A group of stars that make a pattern is called a **constellation**.

See how the lines connect stars together in two groups below? One looks like a big cup. It is part of a larger constellation. The other looks like a little cup. Its stars make up a second constellation.

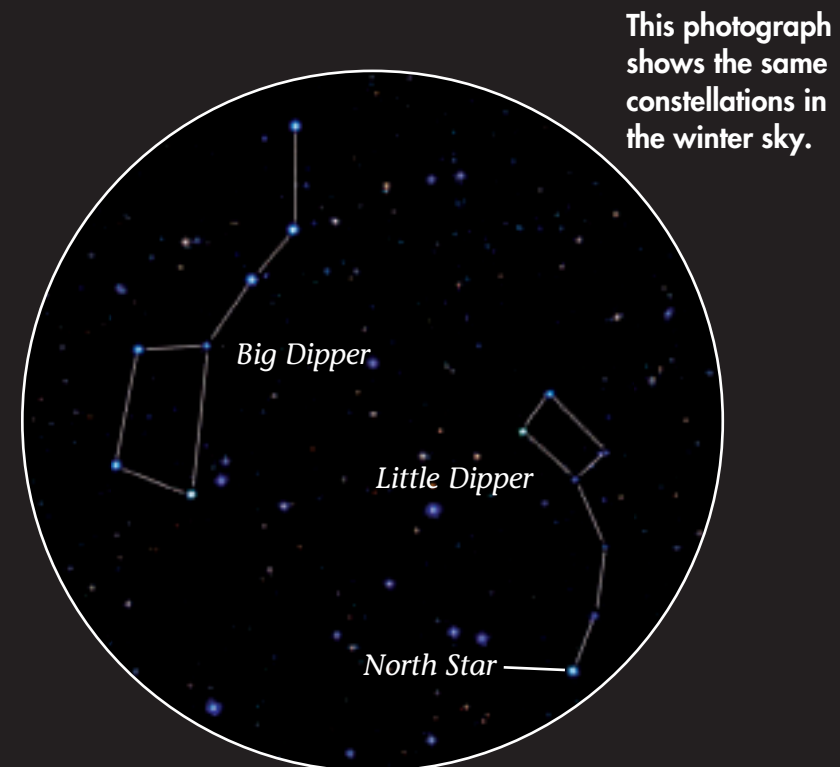


This photograph shows the Big Dipper and the Little Dipper in the summer sky.



Long ago, people saw many shapes in star patterns. They saw objects, animals, and people. They made up stories about what they saw. They gave these constellations names that we still use today.

The stars in a constellation look close together. But they are very far apart. What if you looked at the same stars from faraway in deep outer space? You would see different patterns.



This photograph shows the same constellations in the winter sky.





Like the Sun, stars seem to move across the sky. But the stars really do not move. It just looks that way. This is because Earth is rotating on its axis.

Star patterns change with the seasons. As Earth moves around the Sun, constellations are in different places in the sky.




Look at the sky tonight. You might see the Moon. What phase is it in? Can you see any stars? What about constellations? The sky has many patterns. It is fun to learn about the patterns and watch them.



Glossary

axis	the imaginary line around which Earth spins
constellation	a group of stars that make a pattern
lunar eclipse	Earth's shadow covering the Moon
phase	each different way the Moon looks
revolution	one complete trip around the Sun
rotation	one complete spin on Earth's axis
star	a big ball of hot, glowing gases
telescope	a tool that magnifies faraway objects

What did you learn?

1. Why does the Sun look larger than the rest of the stars in the sky?
2. When are shadows shortest during the day? Explain your answer.
3. What is the phase of the Moon called when it looks like a big circle?
4. **Writing in Science** In this book you have read about the four seasons. Write to explain why the seasons change. Use details from the book.
5.  **Sequence** Explain the phases of the Moon in order.

