

Standard Set 4. Earth Sciences

4. Objects in the sky move in regular and predictable patterns. As a basis for understanding this concept:

4.a. *Students know* the patterns of stars stay the same, although they appear to move across the sky nightly, and different stars can be seen in different seasons.

4.b. *Students know* the way in which the Moon's appearance changes during the four-week lunar cycle.

4.e. *Students know* the position of the Sun in the sky changes during the course of the day and from season to season.

Wonders in the Sky

Genre	Comprehension Skill	Text Features	Science Content
Nonfiction	Follow Instructions	<ul style="list-style-type: none"> • Captions • Labels • Diagrams • Glossary 	Sun, Moon, and Earth's Seasons

Scott Foresman Science 3.7

by Kim Fields



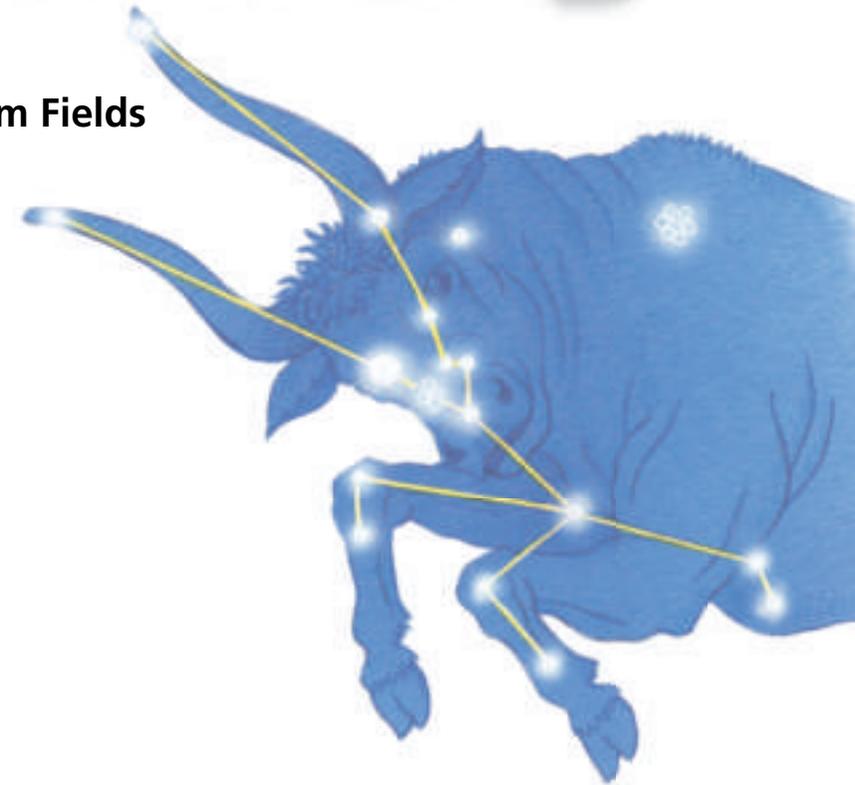
Vocabulary

axis
constellation
phases of the Moon
revolution
rotation



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🔊 Daily Patterns

Earth Spins

Earth is always moving, even though you don't feel it. One way Earth moves is by spinning around an imaginary line. One end of the line would come out of Earth at the South Pole. The other end of the line would come out of Earth at the North Pole. This line is called Earth's **axis**.

Look at Earth's axis in the picture. Imagine you could look down on the North Pole from space. You might see Earth turning counterclockwise. This is opposite of the direction that hands on a clock move. Another way to think of it is that Earth turns from west to east.

Earth turns counterclockwise from west to east around its axis.



Daytime begins when the Sun appears over the horizon. As Earth rotates, this part of Earth is just starting to face the Sun.

🔊 Day and Night

Every 24 hours, Earth makes one **rotation**, or spin, on its axis. A different part of Earth faces the Sun as Earth rotates. Half of Earth faces the Sun. That part of Earth has day. Half of Earth does not face the Sun. That part of Earth has night.

It looks as though the Sun moves across the sky. But it's really Earth that moves! Earth rotates at the same speed each day. You can add together the hours of darkness and sunlight during any day and night. You will always get 24 hours, or one day.



Shadows

When sunlight hits objects, shadows form. Shadows change during the day. When the Sun appears in the east in the morning, long shadows stretch away from the Sun toward the west. Shadows become shorter as the Sun appears to move higher in the sky. Shadows are shortest around midday.



After midday, shadows stretch away from the Sun toward the east. The Sun appears to move lower in the sky toward the west. Shadows become longer. Near sunset, shadows are again very long.

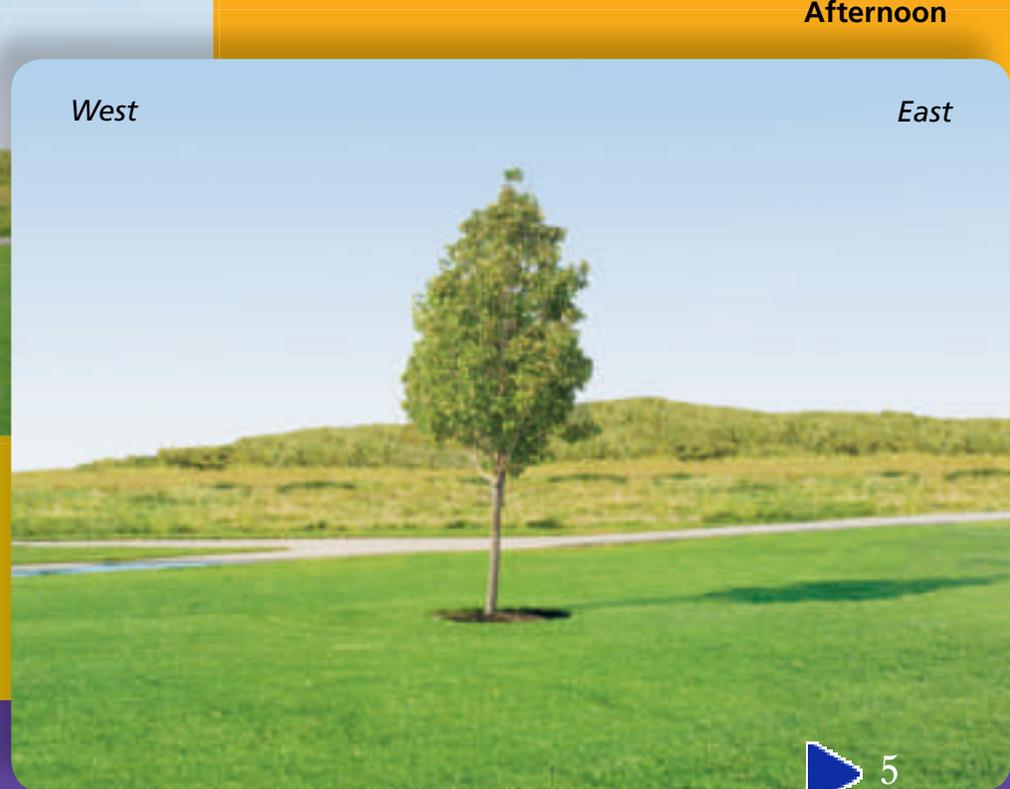
The length and direction of the shadow cast by this tree changes during the day.



Morning



Midday



Afternoon

Yearly Patterns

Earth's Tilt

You have learned that Earth rotates on its axis. Earth moves in more than one way. Earth also moves around the Sun. When an object makes one complete trip around another object in the sky, it is called a **revolution**. It takes a year for Earth to make one revolution around the Sun.

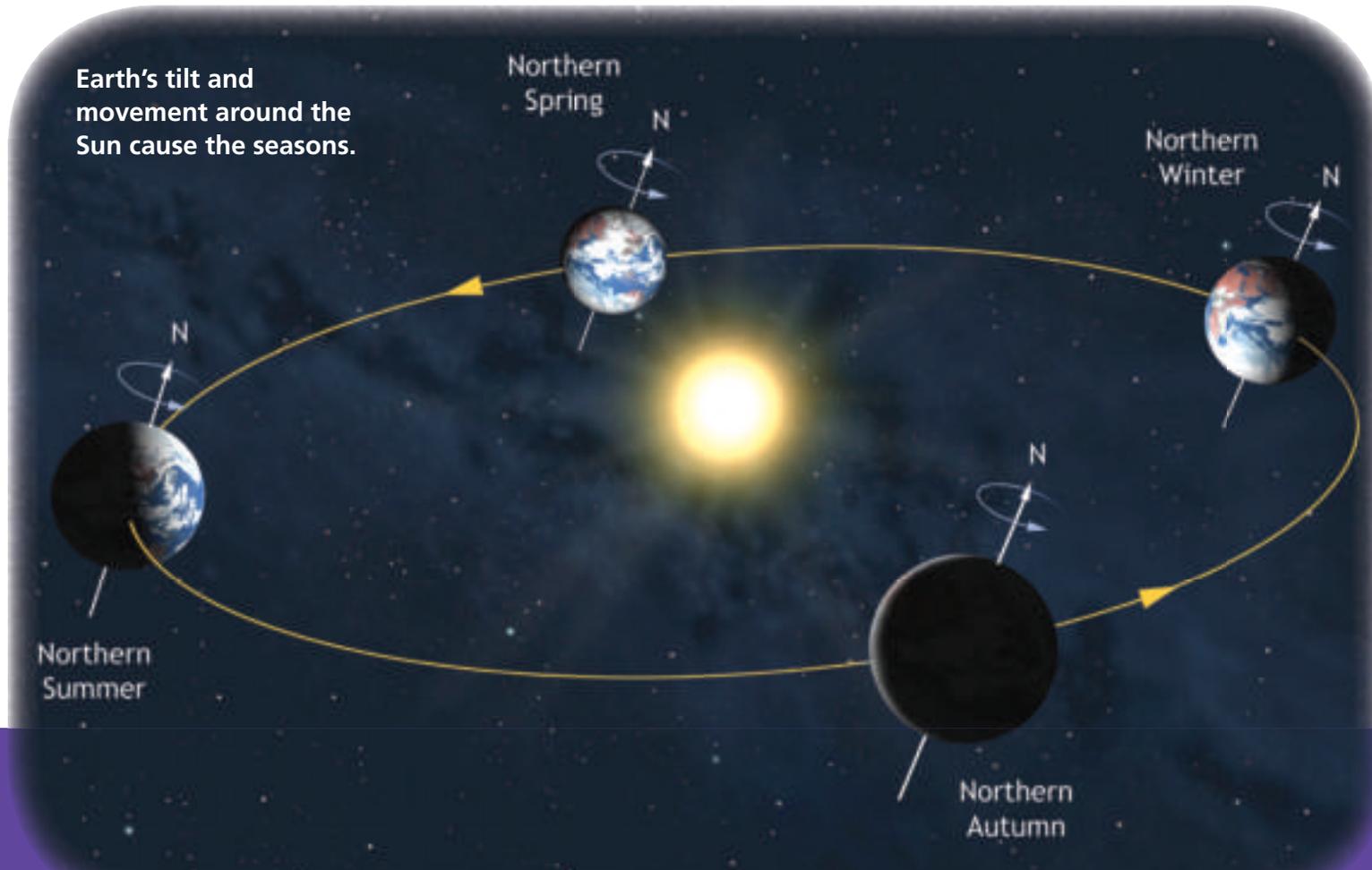
Earth's axis is not straight up and down. It is tilted. Earth's tilt stays the same as it revolves around the Sun. Describe Earth's axis in the picture.



Different parts of Earth are tilted toward the Sun at different times. The northern half of Earth is called the Northern Hemisphere. It is tilted toward the Sun during a portion of Earth's orbit around the Sun. The southern half of Earth is tilted toward the Sun during other parts of Earth's orbit. The part of Earth that is tilted toward the Sun gets the most direct sunlight. This part is therefore heated the most. The part of Earth that is tilted away from the Sun gets the least direct sunlight. It is therefore heated the least.



Earth's tilt and movement around the Sun cause the seasons.





Seasons

Changes in the amount of sunlight and changes in temperature happen in patterns called seasons. In the Northern Hemisphere, temperatures are usually warmest during the summer. Temperatures are coolest during the winter in this hemisphere.

The Northern Hemisphere gets less sunlight when the northern part of Earth's axis tilts away from the Sun. There are more hours of darkness and fewer hours of daylight every 24 hours. As spring comes, the number of daylight hours increases.

Earth's axis does not tilt toward the Sun or away from the Sun during the spring and fall. There are about the same number of daylight hours as hours of darkness. Temperatures are usually cooler than in summer and warmer than in winter. The number of daylight hours becomes less when winter comes.

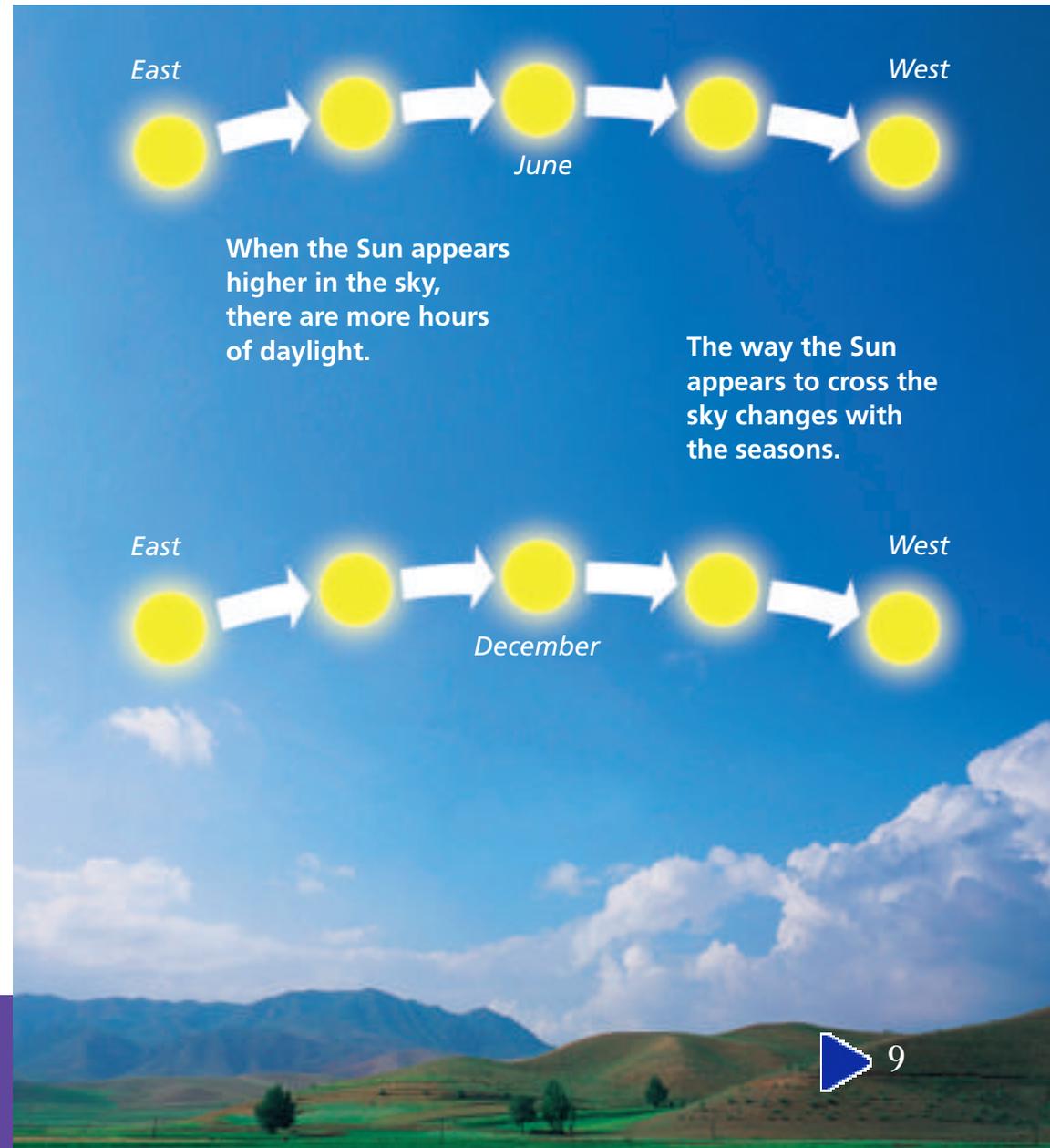


Hours of Daylight in Northern United States	
Month	Number of Hours of Daylight
December	9
March	12
June	15
September	12



The Sun's Position

In different seasons, you see the Sun at different places in the sky. This is because Earth's axis is tilted. The Sun looks like it is farther south and lower in the sky in winter in the Northern Hemisphere. In summer, the Sun looks like it is farther north and more directly overhead.



Moon and Star Patterns

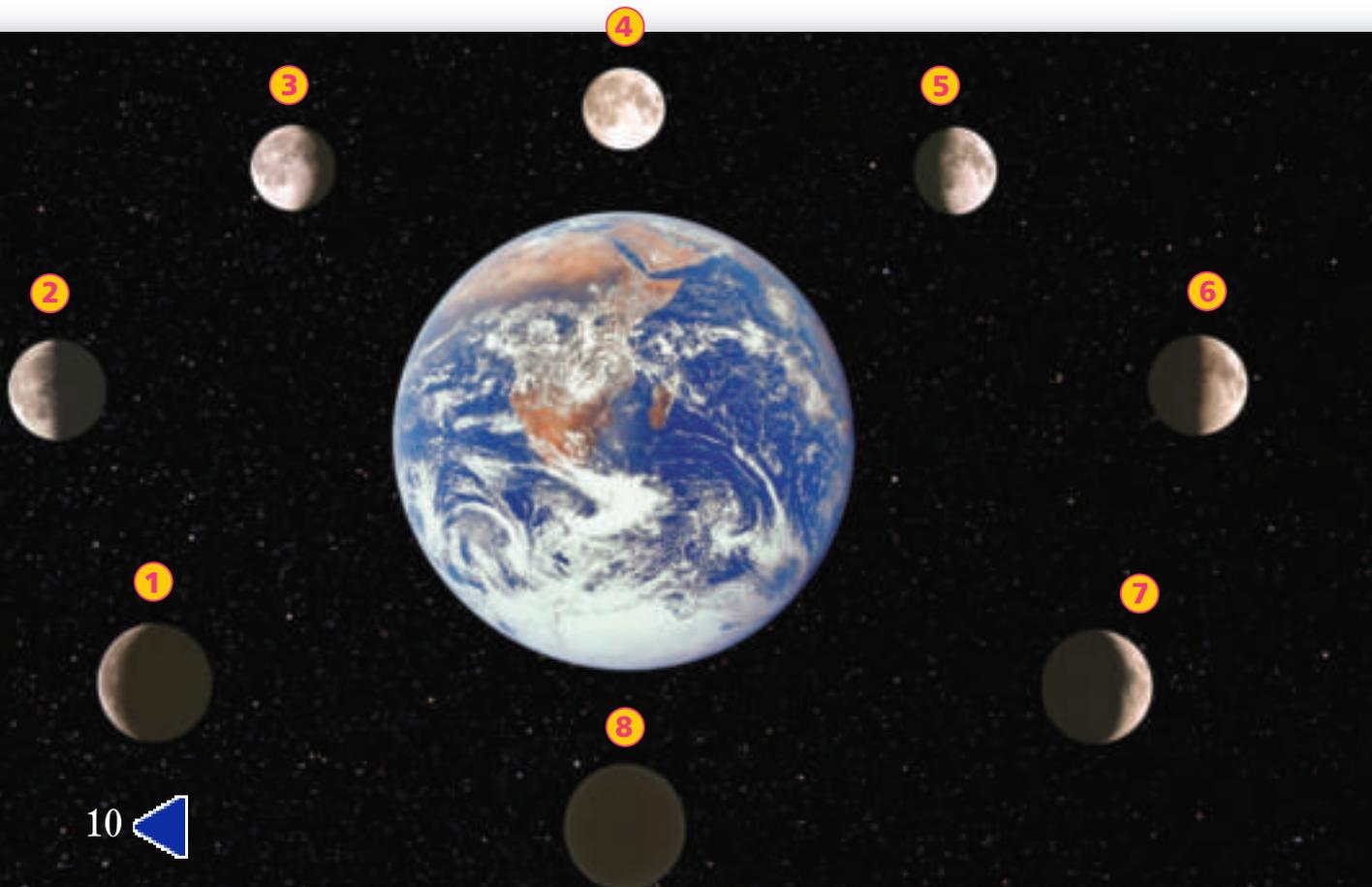
The Moon and the Sun

When you look at the Moon at night, it might look like a bright disk. Other times, the Moon looks like a half circle. Sometimes, it looks like only a thin slice. You cannot see the Moon at all for a little while each month. Sunlight and the movement of Earth and the Moon cause these changes.



The Moon revolves around Earth and rotates on its axis. One half of the Moon is in sunlight almost all of the time. As the Moon travels around Earth, you can see different amounts of the Moon's lit half. These changes are called the **phases of the Moon**. The phases of the Moon repeat in a pattern.

Look at the phases of the Moon below. The Moon starts as a crescent. Then, you can see more and more of the Moon until you see what looks like a circle. This is called a Full Moon. During this time, the Moon is waxing. Then you see less and less of the Moon. Finally, you cannot see it at all. This is called a New Moon. This happens when the Moon is waning.



- 1 *crescent*
- 2 Third Quarter Phase
- 3 *waning*
- 4 Full Moon Phase
- 5 *waxing*
- 6 First Quarter Phase
- 7 *crescent*
- 8 New Moon Phase



Stars

When you look at the dark sky on a clear night, you see thousands of stars. Many of them seem to be in groups that make up shapes. A **constellation** is a group of stars that forms a pattern. The stars in constellations are far outside the solar system. They don't appear to move toward or away from each other.

Draco is the name of one constellation. A summer night is the best time to see Draco. Its name means "dragon." Draco's head looks like a square. You can also see its tail.



In the constellation Draco, the head is on the left.

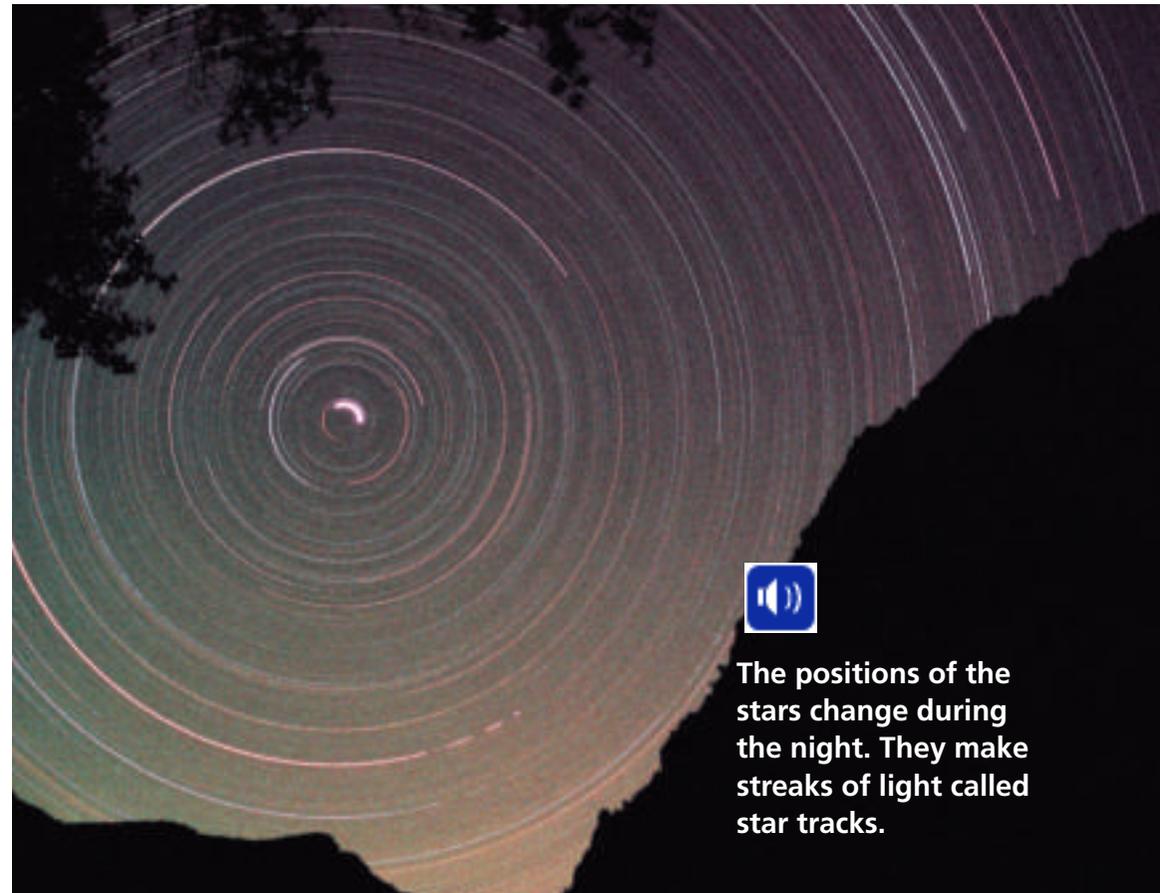


If you look at a constellation in the early evening and then a few hours later, it will seem to have moved. But it has not moved! As Earth rotates, it changes the way the constellations look to us. But they really stay the same.

In the Northern Hemisphere, the positions of the stars appear to rotate around the North Star. To find the North Star, look at the picture of the Little Dipper on the next page. The Little Dipper is part of the constellation called Ursa Minor (the Little Bear). You can see the North Star if you look at the end of the Little Dipper's "handle."



The positions of the stars change during the night. They make streaks of light called star tracks.



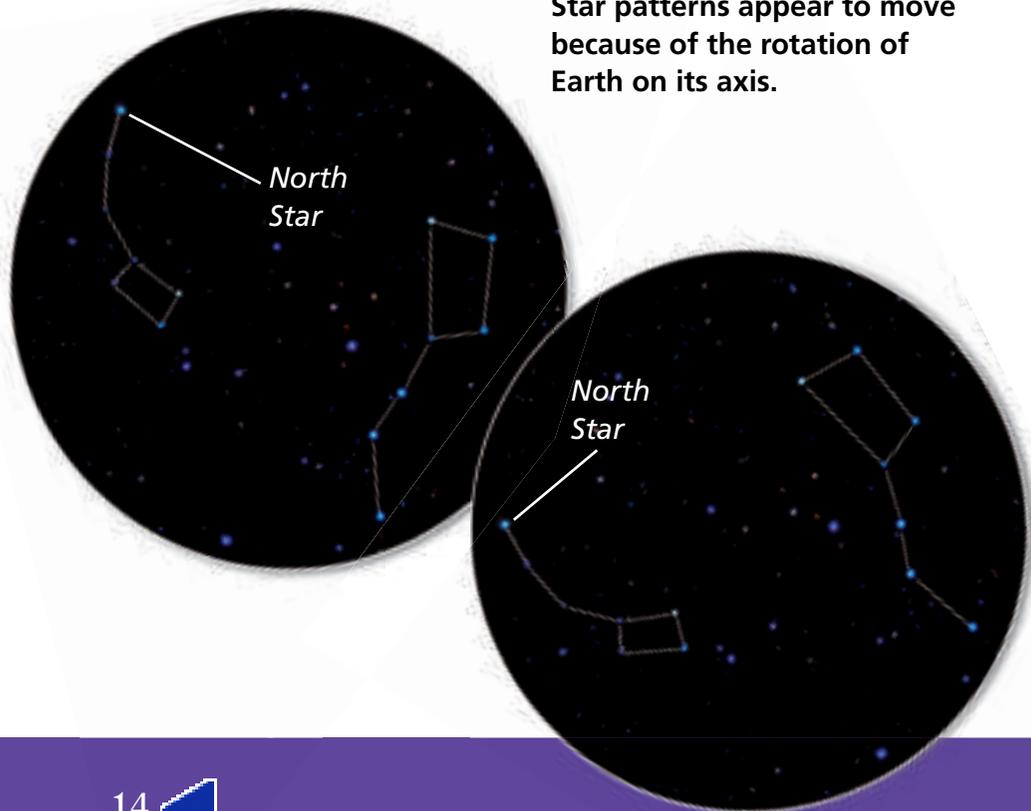


Star Positions

On a clear summer night, you might see Draco. But when you look for Draco on a winter night, it is not in the same place. What has happened?

Earth's revolution around the Sun causes changes in the position of stars at night. In the summer, you see the night sky one way. Over the next six months, Earth moves to the other side of the Sun. You face a somewhat different part of space each night. Finally it is winter. Now you see the night sky from a different point of view than during summer.

Star patterns appear to move because of the rotation of Earth on its axis.



Different Stars

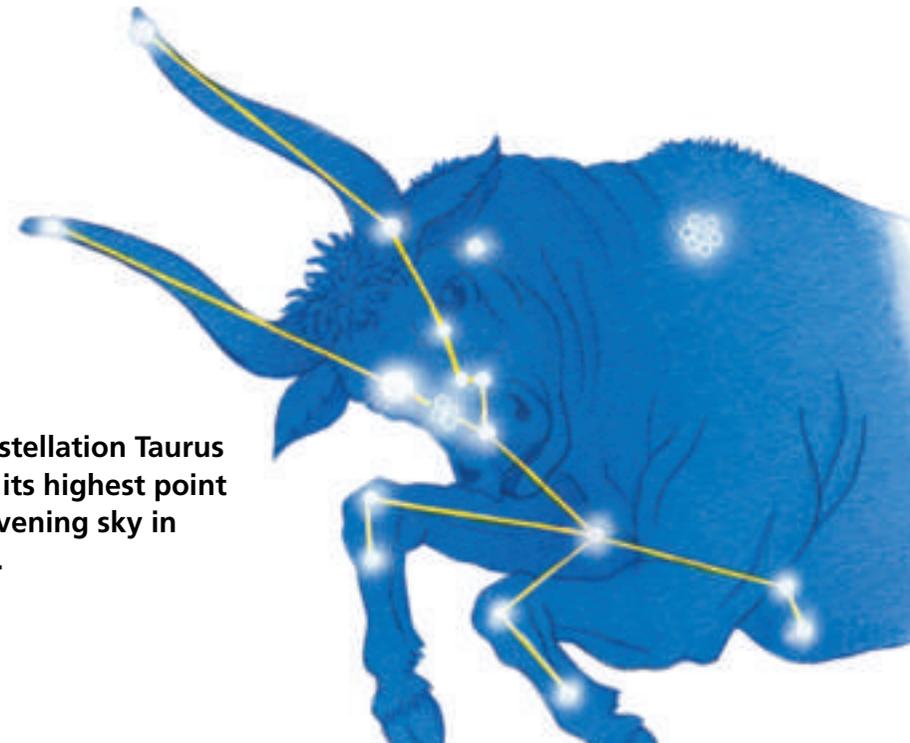
Some stars can be seen year-round. Their position changes, but you can still see them. You can see the Big Dipper year-round. Other stars can only be seen at one time of year. When you cannot see them, they are in the daytime sky. If they were brighter than the Sun, you could see them during the day!

Winter Patterns

In the winter sky, you can see a constellation called Taurus (the Bull). Ancient people thought it looked like a bull. The brightest star in Taurus forms the bull's eye. The position of Taurus changes throughout the year. In the summer, you cannot see Taurus at night.



The constellation Taurus reaches its highest point in the evening sky in January.





Glossary

axis	the imaginary line around which the Earth spins
constellation	a group of stars that make a fixed pattern
phases of the Moon	set of each of the different ways that the Moon looks
revolution	one complete trip an object takes around another object
rotation	one complete spin on an axis

What did you learn?

1. In which direction does Earth spin?
2. Describe why a shadow can get shorter and longer.
3. Name two phases of the Moon.
4. **Writing in Science** Suppose you are standing outside on a clear, winter night. You can see a large constellation in the sky. What do the stars remind you of? Write a paragraph describing the constellation.
5.  **Follow Instructions** Write instructions for how someone could observe the phases of the Moon during one month.