

1. Earth's Rotation

If you filmed the night sky over several hours, you would notice the stars moving. They would make vibrant star trails in circles around a central point. This point is near a star called Polaris, or the North Star. Stars are not the only objects that move in the sky. The sun, for example, also moves across the sky over the course of a day. What causes the stars and the sun to move?

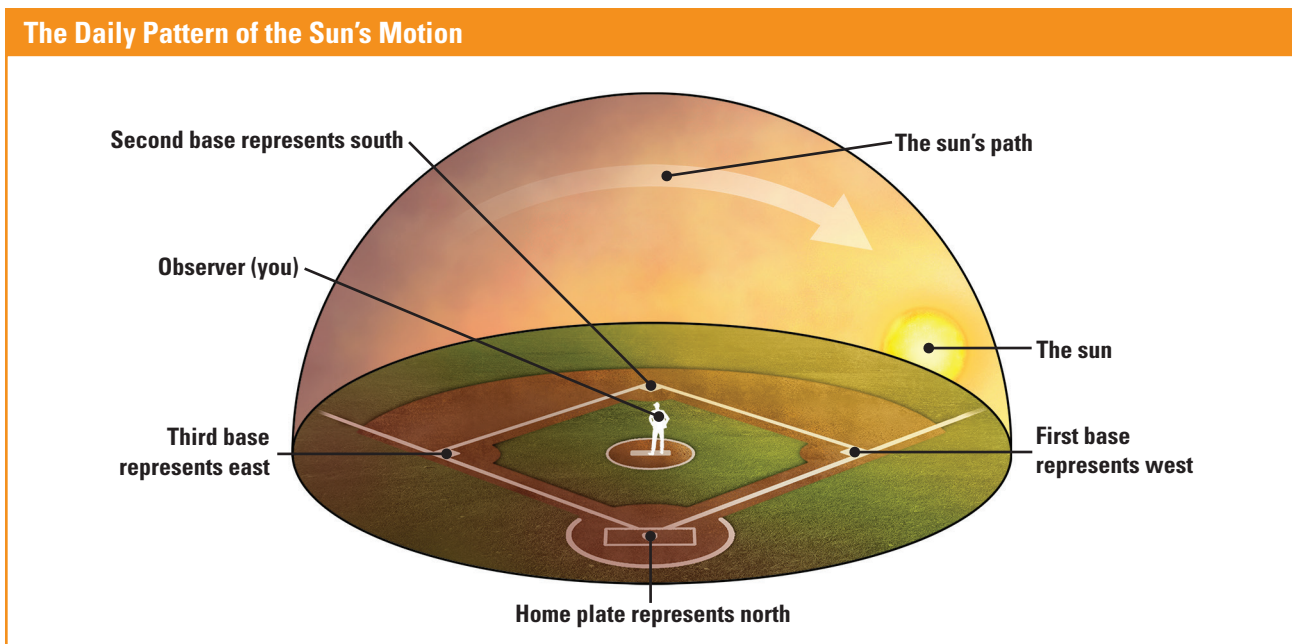
Picture yourself standing on a baseball field like the one shown in Figure 1.1A. Home plate is on the north side of the field, and second base is on the south side. When you stand on the pitcher's mound and look directly above you, you would see the sun rise toward the east, above third base. The sun would travel directly above you, across the sky, until it sets toward the west, above first base. Although the sun may not rise exactly due east or set due west, the overall pattern of the sun rising in the east and setting in the west does not change.

The stars, sun, and moon are all called celestial objects. A **celestial object** is an object in space that is not placed there by humans. The stars, the sun, the moon, and even the planets are all celestial objects. From Earth, celestial objects appear to move across the sky every day and every night. However, it is usually not their motion that we see; it is Earth's!

If many celestial objects do not move, why do we observe them traveling across the sky? In this case, it is because you are standing on Earth, a moving object; this is one example of a cause and effect relationship, where one event causes another to happen. Suppose you were riding on a carousel in a park. When you look out, you would see the rest of the park spinning in circles. The park is not actually spinning in circles; rather, you are! Similarly, the celestial objects in space appear to move daily in circular patterns because of Earth's spin.

Figure 1.1A

Each day, the sun appears to rise and set. If you were standing on the pitcher's mound, facing south, you would see the sun rise toward the east, toward third base. After traveling across the sky, the sun sets toward the west, toward first base.



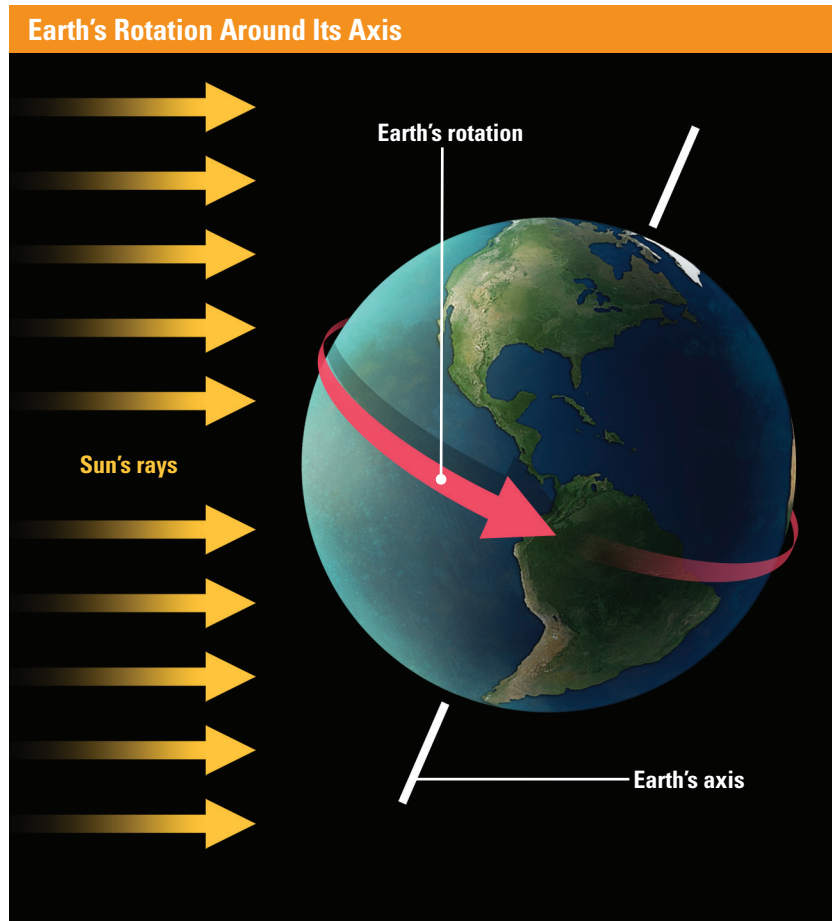


Figure 1.1B

When viewed from the North Pole, Earth rotates counterclockwise around its axis. As Earth rotates, you see the sun rise and then set. Though the sun is barely moving, it appears to move in a circular pattern due to Earth's motion.

Rotation is the spin of an object around a point or a line. The point or line an object rotates around is called its **axis**. A carousel's axis is the metal pole that the platform spins around. Earth does not have a metal pole protruding from its center. Instead, it has an imaginary line that it rotates around. Figure 1.1B shows Earth's axis as it connects the North and South Pole, and goes through the center of the planet.

Earth's rotation is the process that causes the sun to appear to rise and set, even though the sun hardly moves at all. Suppose you are standing in the baseball field in Figure 1.1A. At dawn, Earth rotates and you turn towards the sun, and you observe the sun appear above third base. Throughout the morning, Earth continues to rotate until noon, when the baseball field is facing the sun. The sun appears above second base. After noon, Earth begins to turn away from the sun until dusk, when the sun appears to set over first base.

Likewise, the stars appear to move across the sky due to Earth's rotation. During the night, Earth continues to rotate. The stars become visible at night as you face away from the sun. Throughout the night, you observe star trails as the stars appear to move in concentric circles around Polaris. However these stars are actually almost stationary in space. Instead, your position changes in relation to these stars as Earth rotates. This causes the stars to appear to move in the sky.