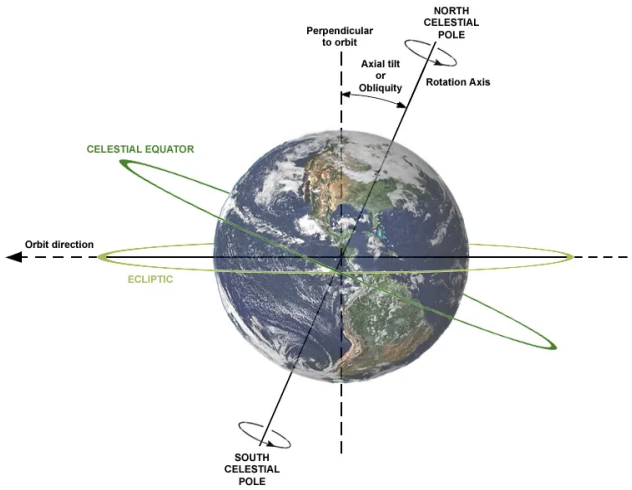
Astronomy Reviewer

The Motions of the Earth

The Earth goes through three types of motions: rotation, revolution, and precession. Let's review them one by one.



How the Earth rotates. Credit: Dennis Nilsson/Creative Commons

The rotation occurs when a body, such as the Earth, spins on its axis. The axis is an imaginary line that passes through the center of the Earth, going through the North Pole and exiting through the South Pole. **It is what gives us night and day.**

One complete Earth rotation equals 23 hours, 56 minutes, and 4 seconds. The Earth's axis is not perpendicular to its orbital plane. Instead, it is tilted 23.5 degrees. However, the value changes as the axial tilt varies between 22.1 to 24.5 every 41,000 years (one **Milankovitch Cycle**). The change in the axial tilt is called **obliquity**.

Because of the Earth's axial tilt, different regions in the Earth experience varying intensities of seasons and different lengths of daytime. The **winter solstice** is the shortest day of the year, while a **summer solstice** is the longest day of the year. An **equinox** occurs when day and night are equal in length.

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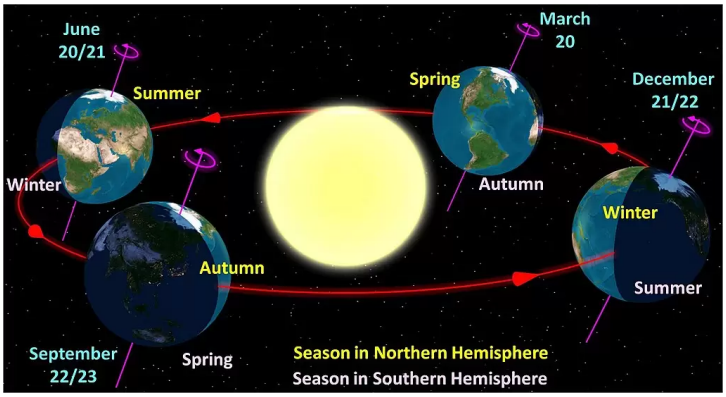
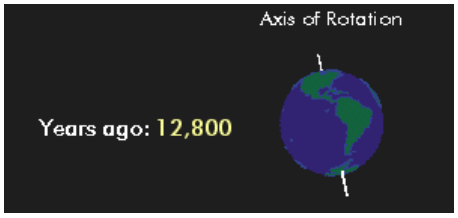


How the Earth revolves around the Sun. Credit: Tau'olunga/Creative Commons

As the Earth rotates, it orbits around the Sun in a process called **revolution**. One complete Earth revolution requires 365 days, 6 hours, and 9 minutes at an average speed of 30 km/s.

When the Earth is at its **aphelion**, it means that the Earth's position in its orbit is farthest from the Sun. When the Earth is at its **perihelion**, it is closest to the Sun.

The Earth experiences a third type of motion that is slower and less prominent– precession. **Axial precession** represents the "wobble" of the Earth as it rotates on its axis, much like a spinning top. Throughout a period of 26,000 years, the direction in which the axis points changes until it completes 360 degrees.



How the Earth wobbles every 26,000 years. Credit: Department of Geography/UCSB