

Module 4: Astronomy – The Solar System

Topic 7 Content: Tilt, Rotation, and Revolution Notes


Introduction

Tilt, Rotation, and Revolution

- Tilt
- Rotation
- Revolution
- Equinoxes
- Solstices
- Precession

Introduction

Tilt, rotation, and revolution are all extremely important to the everyday activities and yearly activities of the Earth. These factors determine the seasons, thus the climate in an area. They also determine the length of days and nights, and even how many days are in a year. Click on each of the tabs in this interactivity to learn more about how the Earth's tilt, rotation, and revolution impact life on Earth.



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Tilt

Tilt, Rotation, and Revolution

Tilt

Rotation

Revolution

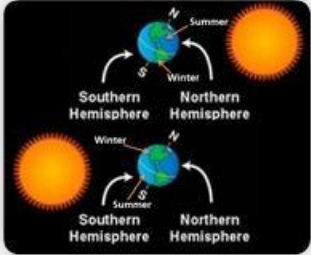
Equinoxes

Solstices

Precession

Tilt

The largest misconception for the reason of the seasons is that when the earth is closest to the sun, it is summer. This is incorrect. The northern hemisphere is actually farther away from the sun during its summer months. The reason for the seasons, rather, is the tilt of the Earth. During the northern hemisphere's summer months, this part of the Earth is tilted toward the sun, whereas the southern hemisphere is tilted away from the sun. During these times, the sunlight strikes the northern hemisphere with direct light versus the indirect light that is striking the southern hemisphere. Direct sunlight gives a higher intensity and is less spread out where it strikes, thus making the area warmer. The indirect sunlight gives a lower intensity and is more spread out where it strikes, thus making it a cooler area.



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Rotation


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Rotation

The Earth has a center imaginary line on which it spins. This invisible line is called the axis of the Earth. The Earth spins or rotates around this axis once every day. The Earth spins on its axis with a tilt of 23.5° . One full rotation on the Earth's axis is a full day.

Only 50% of the Earth can be lit by the sun at one given time because one side of the Earth is facing the sun while the other half is not. This is simply based on the rotation of the Earth. It takes twenty-four hours for the Earth to make one full rotation, which is why there are twenty-four time zones.



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Image source: Gabriel Velasquez

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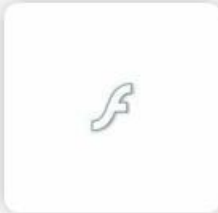
Revolution

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Revolution

The axis of the Earth is tilted at 23.5° , which together with rotation and revolution is responsible for the seasons. While the Earth rotates on its axis, it also revolves around the center of our solar system, the sun. One full revolution around the sun takes a total of 365.25 days. The .25 represents the leap year that will occur every four years.



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Equinoxes

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Tilt

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Equinoxes

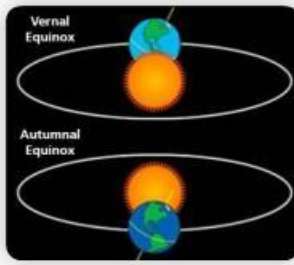
Solstices

Precession

Equinoxes

There are certain times of the year where there are equal times of day and night. These are called the equinoxes. These occur during the revolution around the sun where neither the northern hemisphere nor southern hemisphere is tilted toward the sun. These are the vernal equinox and the autumnal equinox.

The vernal equinox occurs at a point on the celestial sphere where the sun passes over the celestial equator moving northward. This happens on or around March 21st. The celestial sphere is an imaginary circle surrounding the Earth on which



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The vernal equinox occurs at a point on the celestial sphere where the sun passes over the celestial equator moving northward. This happens on or around March 21st. The celestial sphere is an imaginary circle surrounding the Earth on which all other objects, (sun, moon, stars, planets) appear to be moving. Equal day and night occur during this time.

The autumnal equinox is the point on the celestial sphere where it passes over the celestial equator moving southward. Equal day and night occurs on or around September 23rd.

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Solstices

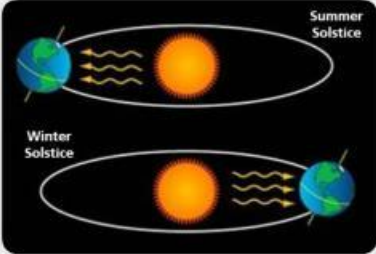
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Solstices

There are other times of the year during the revolution of the Earth around the sun, where there is more day time or more night time. These are called the solstices. The summer solstice is the point on the celestial sphere where the sun is at its most northern point and summer begins in the northern hemisphere on or around June 22nd.

The winter solstice is the point on the celestial sphere where the sun is the farthest south and the winter begins in the northern hemisphere around December 25th.



The diagram consists of two parts. The top part, labeled 'Summer Solstice', shows the Earth tilted towards the Sun. The Sun is on the right, and the Earth is on the left. Yellow wavy arrows representing sunlight are directed towards the Earth. The bottom part, labeled 'Winter Solstice', shows the Earth tilted away from the Sun. The Sun is on the left, and the Earth is on the right. Yellow wavy arrows representing sunlight are directed towards the Earth.

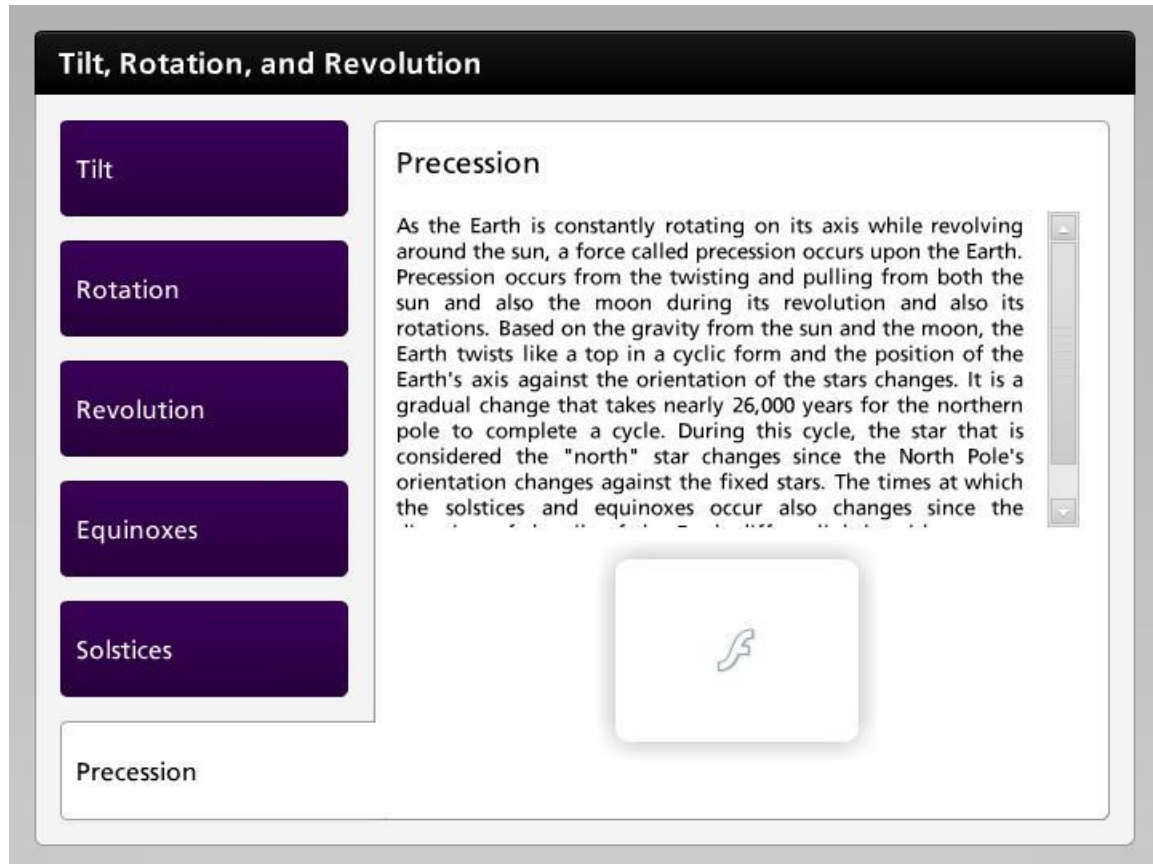
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Precession



The screenshot shows an interactive interface with a dark header 'Tilt, Rotation, and Revolution'. On the left is a vertical menu with buttons for 'Tilt', 'Rotation', 'Revolution', 'Equinoxes', 'Solstices', and 'Precession'. The 'Precession' button is selected. The main content area has the title 'Precession' and a text block explaining the phenomenon. Below the text is a large, empty white box with a faint icon of a hand cursor, indicating a missing image or diagram.

Tilt, Rotation, and Revolution

Precession

As the Earth is constantly rotating on its axis while revolving around the sun, a force called precession occurs upon the Earth. Precession occurs from the twisting and pulling from both the sun and also the moon during its revolution and also its rotations. Based on the gravity from the sun and the moon, the Earth twists like a top in a cyclic form and the position of the Earth's axis against the orientation of the stars changes. It is a gradual change that takes nearly 26,000 years for the northern pole to complete a cycle. During this cycle, the star that is considered the "north" star changes since the North Pole's orientation changes against the fixed stars. The times at which the solstices and equinoxes occur also changes since the

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