

Lesson-3

Motions of the Earth.

Introduction

In the ancient , people believed that the earth was stationary, and the heavenly bodies moved around it. In 1530 BCE, **Nicolaus Copernicus**, a Polish astronomer, proposed that the Earth spins on its axis once every day and also revolves around the sun once a year. He was right. Not only does the Earth rotate on its axis but it also revolves around the Sun once a year. The earth is in constant motion. The movement of the earth around its axis is called rotation. The movement of the Earth around the Sun is called revolution. Both these movements take place simultaneously.

Rotation of the Earth

The Earth spins on its axis from east to west. The axis of the earth is inclined at an angle of $23\frac{1}{2}^{\circ}$ vertically and $66\frac{1}{2}^{\circ}$ from the plane of the Earth's orbit. The tilt of the Earth's axis is called the **inclination** of the Earth's axis. This inclination of the Earth's axis causes the unequal duration of the day and night at different places. It also causes a difference in temperature between different regions on the Earth. Without the inclination of the Earth's axis, there would be no distinct change in seasons. It is due to the inclination of the Earth's axis that the poles have six months of daylight and six months of night. It takes about 24 hours to complete one rotation. One rotation is equivalent to one earth day.

Effects of rotation

The rotation of the earth has the following effects:

- It causes day and night. One half of the Earth facing the Sun gets sunlight while the other half remains in darkness. As the Earth rotates it also creates the clearly visible movement of the sun from east to west across the sky.
- The rotation of the Earth causes tides.
- The rotation of an Earth exerts an outward force near the equator creating an equatorial bulge and flattening of the Earth near the poles.

Due to the Earth's spherical shape, only one half of the earth faces the sun and receives sunlight. The imaginary line that divides the part of the Earth which has day from the part of the Earth which has night is called the **Circle of Illumination**. Different place on the Earth gets varying amounts of sunlight at different times of the day. That is why in a day we have dawn, sunrise, mid-day, sunset, dusk and midnight.

Revolution

The movement of the Earth around the Sun, is called Revolution. The Earth moves around the Sun along an elliptical path called the orbit. As the orbit is **elliptical** , the distance between the Sun and the Earth changes with motion.

The Earth completes one revolution in 365 days and 48 minutes and 45 seconds, that is, approximately 365.25 days. We count only 365 days in a year. The remaining 6 hours are added up and after every four years we get an additional day. Such a year has 366 day and February has 29 days in that year and is called **leap year**. This extra day in the month of February is called leap day.

Effects of Revolution

The Earth's axis is tilted from perpendicular therefore different parts of the Earth are positioned towards the Sun at different times of the year. The change of season is a direct affect of revolution. The four seasons spring, summer, autumn and winter are results of this.

Now we will see what is Solstices and Equinoxes

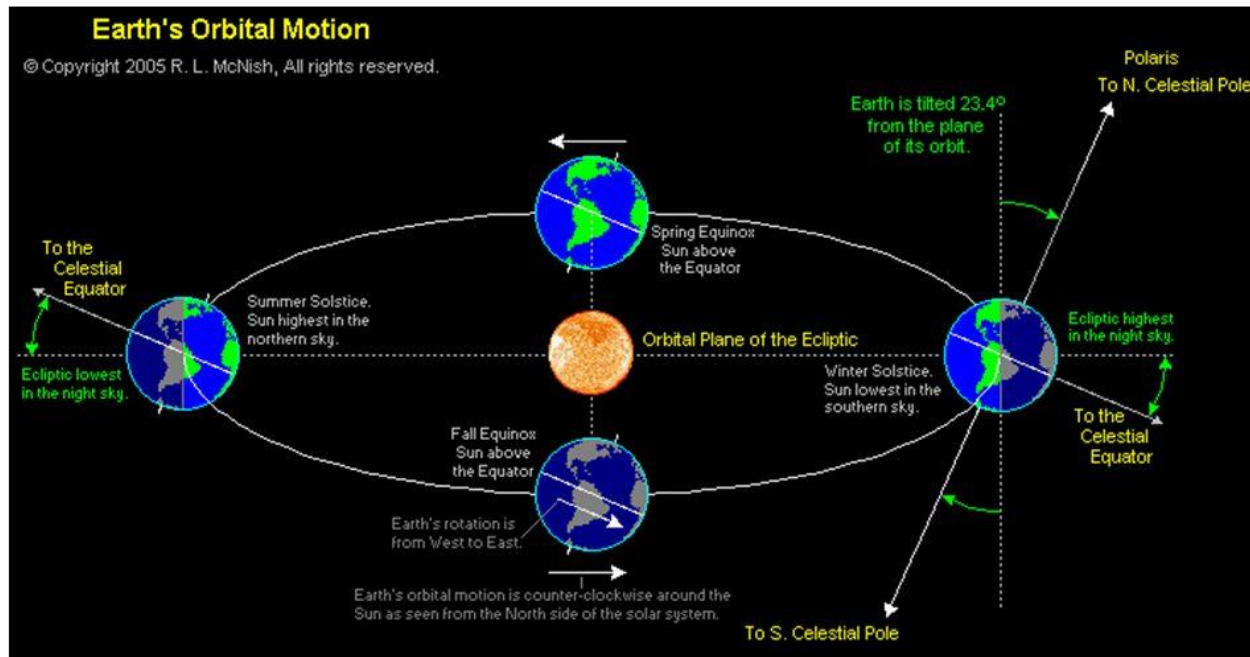
Solstices

Twice in a year, the Earth is at a maximum distance from the Sun. The days on which this phenomenon occurs are called **summer solstices** and **winter solstices**. In the Northern Hemisphere, the summer solstice occurs on the 20th June or 21st June. The winter solstice in the Northern Hemisphere occur on the 21st December or 22nd December . The situation is exactly the opposite in the Southern Hemisphere. Therefore the summer solstice in the Southern Hemisphere occurs on the 21st December or 22ndDecemeber. On the 20th June or 21st June the Southern Hemisphere experiences the winter solstice. During the solstices, the rays of the Sun shine directly on one of the two tropics. During the June or the summer solstices, the rays of the sun fall directly on the Tropic of Cancer and during December or the winter solstice, the Sun's rays fall directly on the Tropic of Capricorn.

Equinoxes

Twice a year, the Sun shines directly above the equator. These days are called the equinoxes. During the equinoxes, the length of the days and nights are equal. The **vernal equinox** the beginning of the spring in the Northern Hemisphere. It occurs on 21st March. The autumnal equinox occurs on 23rd September. To understand more see the diagram on next slide.

Solstices and Equinox



The Seasons, Solstices and Equinoxes