

Why Do We have Seasons?

As the earth spins on its axis, producing night and day, it also moves about the sun in an elliptical (elongated circle) orbit that requires about 365 1/4 days to complete. The earth's spin axis is tilted with respect to its orbital plane. This is what causes the seasons. When the earth's axis points towards the sun, it is summer for that hemisphere. When the earth's axis points away, winter can be expected. Since the tilt of the axis is 23 1/2 degrees, the North Pole never points *directly* at the Sun, but on the summer solstice it points as close as it can, and on the winter solstice as far as it can. Midway between these two times, in spring and autumn, the spin axis of the earth points 90 degrees away from the sun. This means that on this date, day and night have about the same length: 12 hours each, more or less. These are the equinoxes.

Why should this tilt of the Earth's axis matter to our weather? Think about the flashlight demonstration. What was the difference between the two. One was direct and one was indirect. As the angle increases, the *concentration* of light decreases. In other words, the amount of light per square centimeter drops (the number of square centimeters increases, while the total amount of light stays the same).

The same is true on the earth. When the sun is overhead, the light is falling straight on you, and so more light (and more heat) hits each square centimeter of the ground. When the sun is lower in the sky, the light gets more spread out over the surface of the earth, and less heat (per square centimeter) can be absorbed. Since the earth's axis is tilted, the sun is higher when you are on the part of the earth where the axis points more towards the sun, and lower on the part of the Earth where the axis points away from the sun.

For the Northern Hemisphere, the axis points most toward the sun in June (specifically around June 20), and away from the sun around December 22. This corresponds to the Winter and Summer Solstice (solstice is Latin for "the sun stands"). For the Southern Hemisphere, this is reversed.

Of course because the sun gives us heat, the amount of sunlight that each area of the earth receives affects the seasons as well. On June 20, the Northern Hemisphere is tilted toward the sun and getting more energy from the sun than the Southern Hemisphere. That energy is stored in the continents and oceans, increasing the temperature of those areas overall. When you combine this with the angle of the sunlight for a given area, you get an idea of why we have the seasons.

