

The Longest Day of the Year

On June 21st the Northern Hemisphere will experience the summer solstice – the longest day of the year. If you want to make your celebration official, the United Nations named June 21st as the “International Day of the Celebration of the Solstice”.

Seasons and variable day and night lengths are not experienced on all planets; it happens because the Earth’s axis of rotation is tilted approximately 23.4° . The summer solstice occurs when the Earth’s tilt towards the sun is at its maximum and the Sun’s apparent path is the farthest north from the equator. As a result, more than half of the hemisphere is in sunlight at the moment of solstice. Once we pass the summer solstice, the days start becoming shorter. By the winter solstice on December 21st, the tilt of the Earth towards the sun will be at its minimum angle in Canada and will we receive the fewest hours of daylight. On December 22nd, the days will start to lengthen and in six short months, the summer solstice will occur again.

Why is the Earth’s axis of rotation tilted? The “Giant Impact Hypothesis” posits that soon after the Earth formed approximately 4.5 billion years ago, a Mars-sized protoplanet hit the Earth and knocked it off-kilter. So instead of the Earth rotating with its axis straight up and down, it now tilts.

Now you Try:

Let’s verify that the summer solstice is the longest day of the year. You could use a regular clock, but let’s try something a little more ambitious. Let’s make a sundial, the oldest known instrument for telling time. In general, sundials consist of a flat disk with time markers and a thin rod that casts a shadow (a gnomon) which tells the time. As the sun moves across the sky, the position of the shadow on the flat disk changes.

Gather the following materials: ruler, pencil, clock, paper plate, plastic straw and some stones. Start early (let’s say 9:00am) and pick an open sunny location for the best result. Poke a hole in the centre of the paper plate. Write 9:00 somewhere on the edge of the plate. Draw a straight line from the 9:00 to the hole in the centre of the plate. Put the plate on the ground and poke the straw through the hole in the middle. Slant the straw towards the line you drew. Carefully rotate the plate until the shadow of the straw matches the line you drew. Place the stones on the plate to hold it in place. Don’t move your plate.

Come back in one hour. At 10:00am, write 10:00 on the edge of plate where the shadow is now falling. Return at 11:00 and repeat. Come back once an hour as long as there is a shadow falling on the plate. You have now made a sundial. Do you think it works? Try using your sundial the next day at random intervals, and tell the time. Use a watch to confirm the accuracy of your sundial. Did it work?

References:

- <https://www.scientificamerican.com/article/its-about-time-to-make-a-sundial/>
- <https://kids.britannica.com/students/article/solstice/623562>