

## **Solstice fact sheet 'Blame it on geometry'**

A solstice can be defined in a number of ways but few really explain the mechanics of the phenomenon. Firstly, a solstice can be said to be either of the times each year when the sun is furthest from the equator. It is also the time when the sun is vertically above the Tropic of Cancer in the northern hemisphere or the Tropic of Capricorn in the southern hemisphere. When the northern hemisphere experiences its summer solstice (nominally on the 21<sup>st</sup> of June), this results in that hemisphere experiencing its longest day of the year while the southern has its longest night. The situation is reversed at the time of the second annual solstice, nominally on the 22<sup>nd</sup> of December.

While these definitions are correct, they are also a little misleading because they create the impression that the sun moves in the heavens, whereas as we all know that the earth moves around the sun. To understand why the solstices occur, it is best to begin with the movement of the earth. The earth revolves around its own axis once every 24 hours, resulting in the cycle of night and day. At the same time, it is orbiting around the sun, with each orbit taking one year or 365,25 days.

Now comes the tricky bit. Imagine that the earth's orbital plane is something like an elliptical (slightly oval) disc with the sun stationary at its centre. The earth's own axis of rotation is not at right angles to the orbital plane, but actually tilts over at  $23,5^{\circ}$ . This tilt remains constant as the earth orbits the sun, resulting in the angle at which the sun's rays strike the various parts of the earth's surface constantly changing throughout the year. Because the earth is tilted as it orbits the sun, to an observer on earth the sun appears to move between north and south as the seasons change, just as it seems to travel from east to west during the course of a day. When the sun appears to be directly above either the Tropic of Cancer ( $23,5^{\circ}$  North) or the Tropic of Capricorn ( $23,5^{\circ}$  South), a solstice occurs. (The latitude of the tropics is a direct result of the angle of the tilt.)

The northern hemisphere's winter solstice is the southern hemisphere's summer solstice, and vice versa. The tilt of the earth also results in the sun disappearing below the horizon during winter in the Arctic and Antarctic and remaining above the horizon during the summer (the so-called "midnight sun"). Antarctica experiences around three almost sunless months during winter, with the winter solstice marking the mid-point of this period.

Generally "midwinter" in Antarctica, the solstice is celebrated at all bases with over-wintering personnel. This has been a tradition since the early days of exploration at the turn of the 20<sup>th</sup> Century. A festive lunch or dinner is prepared, attended by everyone at the base. Fancy-dress costumes are a popular feature of the festivities, while many bases also hold variety concerts and publish commemorative journals, featuring the talents of the team members.

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