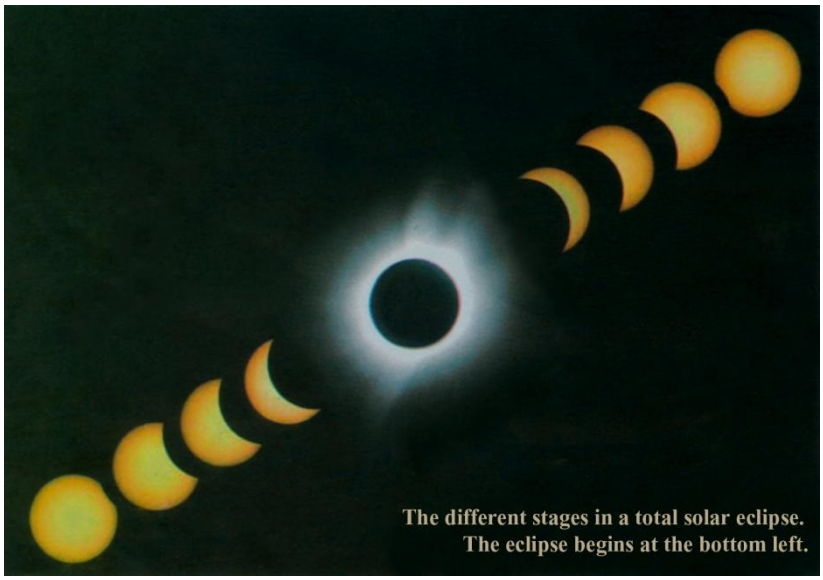
# Total Solar Eclipse - A real life awe-inspiring experience in 21st century

The **Total Solar Eclipse** of longest duration in 21st century will unfold on **July 22, 2009**. This eclipse is a rare event as there will not be another one until June 3, 2114. The path of totality of the eclipse will pass over thickly populated regions of West, Central, East and North East India and thus it provides a rare opportunity to view this spectacular event of this century. A total eclipse of the Sun was last seen in India on August 11, 1999.



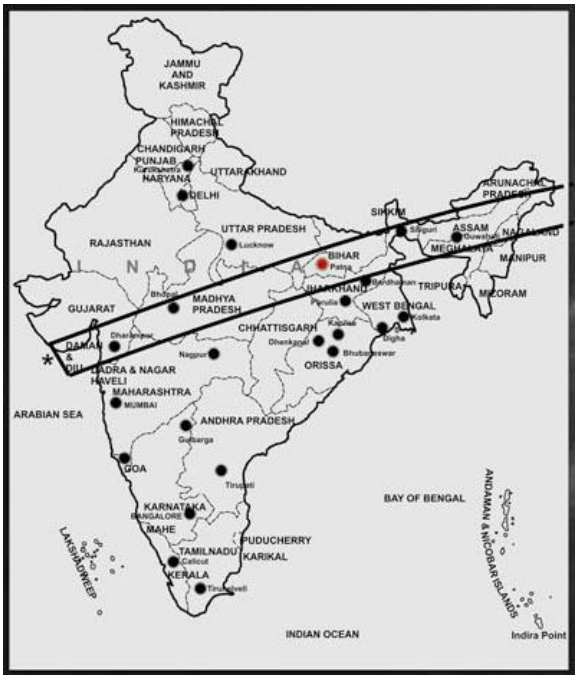
The different stages in a total solar eclipse. The eclipse begins at the bottom left.

During a solar eclipse, the Moon actually casts two shadows towards Earth. One shadow is called the umbra which becomes smaller as it reaches the Earth. The second shadow is called the penumbra which becomes larger as it reaches the Earth. A total solar eclipse, or a complete blocking out of the Sun's light, can only be seen from the area on the Earth's surface that enters the Moon's umbra, the smaller shadow. People viewing the eclipse from the area of the Earth's surface that enters the penumbra, the larger shadow, will see only a partial blocking of the Sun.

As the Moon passes between the Sun and the Earth, the Moon begins to block out some of the Sun's light casting a shadow on the Earth. A small "bite" appears on the western edge of the Sun. The Moon continues to move in front of the Sun, until only a small crescent of light can be seen. The sky begins to darken as the crescent of the Sun remains in the sky. Thin wavy lines, called Shadow Bands appear on plain surfaces on the ground. Shadow Bands are caused by the irregularities in the Earth's atmosphere. As the crescent disappears, tiny specks of light are visible around the edge of the Sun. These specks of light are called Baily's Beads and are the last rays of sunlight shining through the valleys on the edge of the Moon. Suddenly the sky is dark, but if we look toward the horizon we will see a reddish glow which looks like a sunset. Once the Sun is totally eclipsed, the Sun's corona can be seen shining in all directions around the Moon. This is a spectacular sight because the only time the Sun's corona can be seen is during a total solar eclipse. Also visible during a total solar eclipse are colorful lights from the Sun's chromosphere and solar prominences shooting out through the Sun's atmosphere. When the total eclipse of the Sun is completed, the shadow of the Moon passes and sunlight appears once again at the western edge of the Sun. The corona disappears, Baily's Beads appear for a few seconds, and then a thin crescent of the Sun becomes visible. Daylight returns and the Moon continue to orbit the Earth. The total solar eclipse is over.

The eclipse of July 22, 2009 begins at $5^h$ $28^m$ IST and ends at $10^h$ $42^m$ IST. The beginning of the partial phase of the eclipse is not visible over major portion of India (Western, Central and Southern regions) as the Sun will rise after the beginning of the eclipse. But the ending of the partial phase of the eclipse is visible from all parts of India. The totality is visible from a narrow path in the western, central and north eastern parts of India. Duration of totality for a place depends on its distance from the central line within the path of the total phase. In India, it varies from 11 seconds to 4minutes 21 seconds. The Indian cities through which the shadow of total eclipse passes are Bhavnagar, Surat, Ujjain, Indore, Bhopal, Sagar, Jabalpur, Varanasi, Allahabad, Gaya, Patna, Bhagalpur, Jalpaigudi, Guwahati and Dibrugarh. However, small towns like Ujjain, Bhopal and Taregana would offer a better view of the celestial event. NASA has declared that the best place

to watch the solar eclipse is Taregana's Sun Temple", a place 25 km from Patna. Aryabhatta, the genius 6th century astronomer – mathematician, who discovered the notion of zero and also proposed that the earth rotates on its axis, had traced out this location centuries back and made his observatory at the sun temple in Taregana.




Total solar eclipses are of special interest to astronomers because it's the only time they can study the corona, glowing gases near the sun's surface and solar flares, which are normally not visible due to the brightness of the sun. The biggest scientific achievement during the total solar eclipse on 29 May 1919 was the corroboration of Einstein's General Theory of Relativity, which had predicted bending of light by massive bodies. The existence of the element Helium was first detected in the tobacco fields of Guntur in Andhra Pradesh by the French astronomer Pierre Janssen during the total solar eclipse observation on August 17, 1868. The name of the first Indian astronomer to take scientific observation of a total solar eclipse on January 22, 1868 from Jeur in Maharashtra is K.D.Naegamvala.

A total solar eclipse is beautiful, but can also be dangerous to our eyes. When the sun is **COMPLETELY** covered by the moon and only the corona is visible, it is safe to look at it without protection.

But, during a **PARTIAL SOLAR ECLIPSE** or the partial phase of a total solar eclipse, looking directly at the Sun without any type of protection can **BURN** a part of our eye called the retina. We wouldn't even feel the burn happening, but the damage could be permanent.

There are only a few safe ways to watch a total solar eclipse. One is with a pair of approved eclipse glasses, an eclipse viewer that you can buy, or with a pinhole camera. The eclipse may also be televised and it is safe to watch a solar eclipse on television.

No matter how tempting it might be to glance at the Sun, DON'T DO IT. Looking at the Sun at any time can permanently damage your eyes.

NEVER look at the Sun through sunglasses, exposed film, or smoked glass.
NEVER look at the Sun through a telescope or binoculars.
NEVER look at the Sun directly any time, even when the Moon is partially blocking the Sun's light. There is still a danger of damaging your eyes.
ONLY **when the Sun is fully obscured by the moon** during the total phase the totally eclipsed Sun can be watched with naked eyes
YOU CAN view the eclipse of the Sun using a pinhole camera.
YOU CAN view the eclipse of the Sun using a pinhole projector.
YOU CAN view the projected image of the Sun.