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The solar eclipse of the 29th of March 2006, covered a mere 17.5 % of the area of the Sun's disk at maximum, as seen from Delhi. And yet, the enthusiasm seen from the amateur astronomers and students (and the media!) gathered at the Nehru Planetarium, made one wonder whether we were anticipating a total solar eclipse!



Photo: Enthusiasts @ the planetarium lawns

The eclipse served as a learning exercise to know the accuracies with which we could measure angular diameters of the Sun and the Moon and the fraction of eclipse at fixed time intervals, using very simple geometrical techniques.

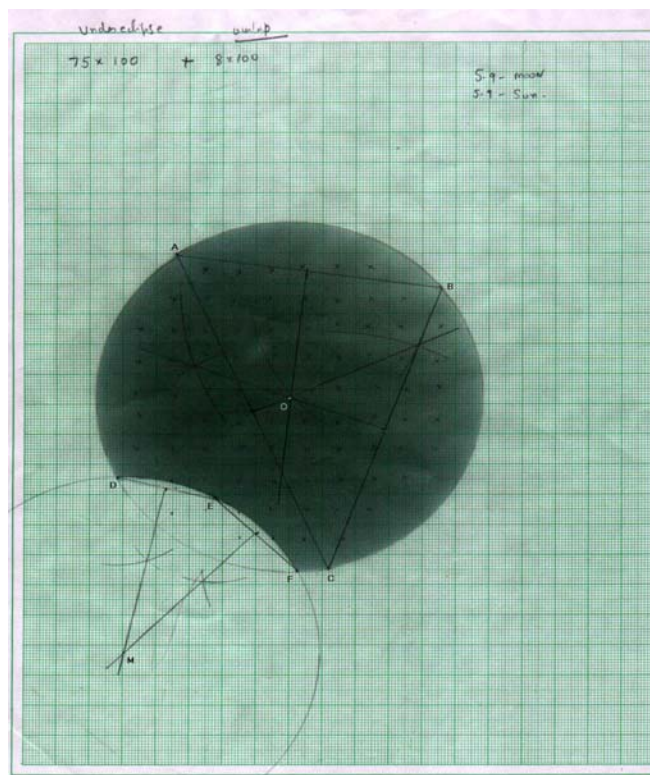
The observers present on this day were Guntupalli Karunakar, Sneha Kesari, Varun Maheswari, Manan Tuli, Anurag Garg, Arpita Pandey, Harsh, Vidushi Bhatia, Pritpal Kaur, Anees Ul-Hasan Siddiqui, Ruchi Kaushik, Sahal Kaushik, and Planetarium staff members.

Playing again with angular diameters!

The following method was adopted to measure the relative angular diameters of the Sun and the Moon. Images of the Sun at different intervals during the eclipse, were captured by a digital camera fixed to the eyepiece end of a 11 cm aperture Newtonian reflector. One example of such an image, printed on a graph sheet, is shown here.

By marking three points A, B and C on the circumference of the circle (see Figure) of the Sun, the circle of the Sun was completed. A triangle was drawn through these three points and the circum-centre O of the triangle gives the centre of the Sun. The radius of the circle of the Sun was determined as

the average of the distance between the circum-centre O and the three points A, B and C marked on the circumference.



Three points D, E and F were also marked on the curved edge of the Moon that is visible on the disk of the Sun, as shown. Perpendicular bisectors of the chords DE and EF meet at point M in the figure, which is the centre of the disk of the Moon. Average of the distance of M to D, E and F, then gives the radius of the disk of the Moon.

The average value of the ratio of angular diameter of the Moon to the Sun, was then obtained from 30 observed images during the eclipse, as 1.013 This can be compared with the known value of the ratio of angular diameters of the Moon and the Sun, on the 29th of March 2006 which was 1.042 ☺

Look for reports of the calculations of obscuration fraction at different time intervals during the eclipse, in forthcoming issues of Krittika!

We turn our attention to the Moon and some quantitative observations of the position of the Moon in the sky. Have you

been noticing the remarkable changes in the direction of the rising Moon as it goes through its phases, this year? This is an interesting year for such observations. For instance, on the 18th April, Moon rose about 123° due East of North. On the 25th of April, the crescent Moon, rising early in the morning, was about 93° due East of North. The Moon moved from rising far South East to rising almost exactly East, in 7 days! On the 2nd of May, Moon rises at 9 AM and is about 57° due East of North. It is now rising due North-East!

Every month, Moon makes these North-South movements. The Sun makes these movements once a year and we call this the Uttarayana and the Dakshinayana movement of the Sun. Sun rises exactly due East on the two equinox days, rises 23.5° due North of East on the Summer Solstice day and 23.5° due South of East on the day of the Winter Solstice. Movements of the Moon are much faster, and the maximum extent due North or South of East/West while rising/setting changes. Once in 18.6 years, these swings are at their maximum extent and 2006 is one of those years! These extreme swings of the Moon once every 18.6 years are referred to, as Lunar standstills.

All we need to do is find a reference point – a building or a tree due east from our house and observe the direction of Moon Rise with respect to this reference point. It will help if we use a compass, of course. One can even draw a circle on the ground and mark the directions on it. We can repeat the same observations about 9 years later and notice that, yes, the Moon seems to be swinging much less due North or South of East at rise times during that year, compared to its swings in 2006.

We can be a little more systematic than that, and measure quantitatively, the directions of Moon rise at different times, in 2006. Our historical heritage has given us a wonderful instrument to make these measurements – the Ram Yantra at the Jantar Mantar observatory of Delhi. [< More In Print Edition >](#)

The Night Sky - May and June 2006

May 3-4 (night): Saturn 6 degrees to left of first-quarter Moon, high in W after sunset.

May 24 (morning): Venus 5 degrees to right of crescent Moon, low in E before sunrise.

May 30 (evening): Mars 3 degrees to left of crescent Moon, in W after sunset.

May 31 (evening): Saturn 3 degrees below crescent Moon, in W after sunset. Much-dimmer Beehive star cluster 1 degree to upper right of Saturn, Mars to lower right.

June 1-7 (evenings): Saturn less than 1 degree from Beehive star cluster (M44), in W after sunset.

June 11-12 (night): Major lunar standstill: full Moon stays low above southern horizon, only 27 degrees above S horizon as it transits at 1:00 a.m.

June 15 (evening): Mars 1 degree to right of Saturn, Beehive star cluster (M44) less than 1 degree to right of Mars, Mercury to lower right, in W after sunset.

Mars 0.6 degrees to upper right of Saturn on June 17.

June 22 (morning): Venus 7 degrees below crescent Moon, Pleiades star cluster (M45) 7 degrees to lower left of Moon, in ENE before sunrise. Venus 7 degrees to right of crescent Moon on June 23.

June 27 (evening): Mars, Saturn, Beehive star cluster (M44), crescent Moon and Mercury in line within 15 degrees, low in W after sunset. Moon 1 degrees above Mars on June 28.

June 29 (evening): Bright star Regulus 2 degrees to left of crescent Moon, high in W after sunset. Mars, Saturn and Mercury to lower right.

Planetarium Programs during May-June 2006

(Mondays closed)

| <i>Life story of a Star</i> | <i>Celestial Shadows</i> |
|-----------------------------|--------------------------|
| 11:30 AM English | 1:30 PM Hindi |
| 4:00 PM Hindi | 3:00 PM English |

In addition Planetarium conducts special school shows that have to be booked in advance. Live Planetarium shows can also be booked on astronomy topics like Solar System, Comets, Gravitation, Sunspots, Pulsars and Moon. Enquiries can be made at 23014504 and 23012994.

Special Summer programs at the Planetarium

(Enquire at 23014504 for timings and registration)

Moon Carnival : Interactive workshops with activities for understanding the Moon, for all ages on every Saturday and Sunday between the 1st of June to the 1st of July 2006.

Art and Astronomy : Workshops on the 20th and 21st of May that train students, teachers and art lovers towards making Astronomy related artwork. Workshop also discusses the influence of Astronomy in art through the ages

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The Ram Yantra At Jantar Mantar

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