

The Total Solar Eclipse of October 24 1995

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1. Introduction

The total solar eclipse of October 24, 1995, whose central line cut across the subcontinent of India, was only the second total solar eclipse visible from India in this century. The previous total eclipse visible from India occurred on February 16, 1980. At that time the print media filed widely varying reports on what the effect of seeing the eclipse would be, without much coordinated input from astronomers. With the new confused advice reinforcing old fears, almost the entire population literally hid indoors, fearing the worst. Many Indian astronomers silently resolved to themselves then, that public education must be taken up with the same level of seriousness as research programmes during the next eclipse.

2. The Background

The total solar eclipse of October 24, 1995 was visible along some of the most populated parts of India and took place during a season of generally clear skies. Elsewhere in the country the eclipse would be partial. So nation-wide, our class was a mere 900 million strong!

Even in the last decade of this century, astronomy education in India is very sparsely serviced below the post graduate level. Several new planetaria have been built around the country since 1980. Clearly they would play a role in public education. So our 900 million strong class could be apportioned between them as far as public education was concerned. But the school, undergraduate and amateur sectors continue to suffer from lack of focussed attention. Here, however, the numbers involved would be much smaller. The Nehru Planetarium decided to use this opportunity to design activities not only for the general public, but also for specific groups of school students, undergraduates and amateurs.

3. Public Education

Besides the staggering numbers, our planning for public education had to contend with two realities. Firstly, whatever material we produced had to be inexpensive and yet fully functional – so that a maximum number of people could benefit from it. Secondly, we had to chip away at deeply entrenched views, perhaps dating back several millennia! This was especially important as the eclipse coincided with the major festival of Deepavali in India and dire consequences due to the coincidence were predicted. We had to consciously devise ways of informing the public of the facts as they stood, without being pompous. For this we needed a starting point.

Early in 1995, we sought the help of various national dailies in locating people who had actually seen the total eclipse in 1980. They were specifically requested to outline what motivated them to see it, how they would describe it and if they suffered any short or long term ill effects. We received around 150 letters from all around the country. Most of the letters said that they or some member of their family had studied science and deliberately planned to see the celestial spectacle. They found it one of the most

thrilling experiences of their lives. None had suffered any bad consequences. There were, however, two exceptions. One was written by some one who was only nine at that time and living in the partial eclipse region. He sneaked out and stared at the partially eclipsed sun wearing goggles and had eye problems to this day and another who had not seen the eclipse but sent me a cutting of the experience of a **doctor** who had lost his eyesight by watching an eclipse, excerpted from the Journal of the Royal College of Ophthalmologists. The 1995 eclipse was visible throughout the country. If through our urging people one million people saw it and 1% of them did so unsafely, it meant a thousand people with impaired eyesight. The publicity given to them would defeat the very purpose of the educationists. These two letters brought to centre-stage, the planetarium's public responsibility in clearly spelling out the danger of viewing the eclipse incorrectly, **without** scaring people off.

Another aspect was to examine in depth, the various negative practices that are associated with eclipses and guess how they may have originated. This could help in putting them in perspective.

Our strategy for public education, therefore rested on three pillars:

- Co-opt media to reach the largest number of people
- Emphasise the safety aspect
- Research ancient references to eclipses and attendant practices

Efforts in this direction led to a highly successful exhibition, a planetarium programme for the sky theatre and of course a press kit of past eclipse photographs and background material. Closer to the actual date of the eclipse, these served as the basis for many articles in the press. This early positioning of the Nehru Planetarium as the prime source of visual material brought many television crews to our door step, expanding our outreach literally a million fold.

4. School Education

To reach the school community, an audio visual show, a slide set and an information kit were produced. Copies were given to competent amateur astronomers, who visited the schools that requested help. Several voluntary organisations also took these to slum children who are normally out of the man made information loop but are well within nature's ! The highlight of the kit was a tiny mirror mounted on a cardboard altazimuth mount that could project the sun inside a room for safe viewing by many people - a perfectly adequate method for partial phases. The more enthusiastic among them were instructed to draw the phases of a projected image of the sun. Photography of the sun with a pin hole camera adequately protected by over exposed x-ray negatives was also taught by the members of the amateurs astronomers association to more keen students.

The nearest point on the central line of totality was 125 kilometres from the capital, Delhi. The planetarium itself arranged for a group of 400 school and college students to go to Ghata on the line of totality. All of them attended an orientation session at the planetarium where they were briefed on what to see, how to observe safety precautions and how to keep a record of the event. An activity book for school students was created and was used in manuscript form during a children's festival on eclipse day in interior Rajasthan, which experienced the earliest totality in the country.

5. Undergraduate Projects

The topics for the undergraduate projects emerged out of questions some of these students themselves raised during lectures that we gave in many colleges of Delhi. The first

project was performed by students of Motilal Nehru College. It involved the construction of a three dimensional model to illustrate why there is no solar and lunar eclipse every, new and full moon day respectively. The cost of construction and the easy availability of the materials used were the two constraints imposed. After experimenting with cardboard, they came up with an acrylic version that worked quite well. Quite a few school teachers borrowed it for demonstration in their schools.

The second project was to make a demonstration video of the flash spectrum during the eclipse. Despite major problems in putting together equipment with no budget at all, a student from St. Stephen's college recorded successfully objective grating spectra using a replica holographic grating on video film. Some of the interesting frames have been digitised and hopefully emission gradients of the Balmer lines can be derived. But the primary value of the film lies in its use as a demonstration movie. It is like reliving the excitement felt by Charles Young in 1870!

The third project was to use a thermocouple to monitor the temperature variation during the eclipse. Although no comparison measurements were made before or after the eclipse the measured variation agreed fairly well with other results reported.

6. Amateur Experiments

The amateur astronomers association at the planetarium decided that it will organise a trip to the central line of totality. Site survey identified two locations, Ghata in Rajasthan and Bhind in Madhya Pradesh as being suitable from the point of view of morning seeing, availability of power and reasonable boarding and lodging facilities. The availability of the terrace of a degree college in Bhind marked it out as a preferred site.

The amateur astronomy movement in India has been at the nucleating stage for several decades. The high costs involved and the lack of access to books, magazines and equipment are only partly responsible for this. The tradition of doing something academic as a leisure time activity is not established in India. Especially the planning and practice so necessary to succeed in recording a phenomenon lasting less than a minute were alien concepts. So incentives were offered. Only those members would join the trip, who had a viable experiment to perform and had put together and tested their equipment in the full moon preceding the eclipse date! The trip thus became an observing expedition! Rudimentary but functional equipment including a heliostat was built and tested and nearly thirty members, from ages 5 to 55, each with an observing plan, were on board the bus that left Delhi for Bhind. Each member was rewarded not only with success but was transformed into a future eclipse chaser. In fact one sequence of calibrated photographs is being analysed for deriving electron densities out to two solar radii.

7. Conclusion

Reports showed that the public education effort had succeeded in a large measure. Interestingly a larger fraction of the city folk stayed indoors than people from towns and villages. What about school, undergraduate and amateur sectors? Although the number of people reached in the last three categories is minuscule compared to the first category, the success achieved is no less important. A twelfth century Arabian astronomer has said that when we place too much emphasis on mere popularisation of science, the quality of science itself falls. In present day India we are in some danger of this. It is for this reason that the Nehru Planetarium has addressed itself to the school, undergraduate and amateur sectors and achieved a modicum of success. In India the outreach of most planetaria to schools stops with concessional tickets to their public shows. It is necessary at the

present juncture for large planetaria to shoulder the responsibility of school education as well as public education through well designed, sustained programmes especially those aimed at teachers. Again amateur activity in many countries is centred on the initiative of the individual, whereas in India it is necessary to deliberately foster it. I have no doubt that the IAU in general and Commission 46 in particular will devise programmes with this end in view for the benefit of star gazers in large parts of Asia, Africa and South America.