

REPORT OF THE SEMINAR ON THE 'TOTAL SOLAR ECLIPSE OF FEBRUARY 16, 1980'

Although eclipses of the Sun occur regularly as the shadow cone of Moon sweeps over the Earth, the total eclipses of the Sun are observed at any given place very rarely because these last for a very short time (maximum possible duration being about 8 minutes) and are visible from a narrow belt which is not more than 150 kilometers in width. At the time of the total solar eclipse, one is able to see the faint outer atmosphere of the Sun which is normally drowned in the light of the solar disc. In order to study the phenomena observable on the Sun at the time of a total solar eclipse, astronomers travel to remote, often inhabitable places. It is very rare that a total solar eclipse is visible from an established astronomical observatory. One such rare opportunity will be provided by the total solar eclipse of February 16, 1980 which will be visible as a total eclipse from Japal-Rangapur Observatory of Osmania University, Hyderabad. It was therefore natural that Centre of Advanced Study in Astronomy (C.A.S.A.) of Osmania University hosted a two day Seminar on March 15 and 16, 1979 to discuss the plans of various astronomical institutions and individuals in India for conducting scientific experiments at the time of this eclipse. Besides over 25 participants of the host institution the seminar was attended by 15 professional and 10 amateur astronomers from various parts of India. Financial support for the seminar was provided by the University Grants Commission (U.G.C), New Delhi through its recurring grants to the C.A.S.A.

The inaugural function held on the morning of March 15 was presided by Prof. G. Ram Reddy, Vice-Chancellor of Osmania University. The seminar was inaugurated by Dr. M.K. Vainu Bappu, Director of the Indian Institute of Astrophysics (I.I.A.), Bangalore. In his inaugural address on 'The Eclipses of the Sun', Dr. Bappu gave a historical outline of the various contributions of the total solar eclipses to the advancement of the Solar Physics. (The text of the lecture will be published separately by C.A.S.A.) Inaugural function was followed by screening of two short films: 'Solar Eclipse' and 'Day of the Dark Sun' made available through the courtesy of the National Science Foundation, Washington, U.S.A.

The afternoon session on March 15 (chaired by Dr. M.K. Vainu Bappu), was devoted to a discussion of optical experiments planned for the total solar eclipse by Indian astronomers. The session was opened by Dr. J.C. Bhattacharyya of I.I.A., Bangalore who has been appointed as the National Co-ordinator for the total solar eclipse of February 16, 1980 by the Indian National Committee on Astronomy. (Dr.S.K. Trehan of Punjab University, Chandigarh will coordinate the efforts on behalf of Indian National Science Academy). Dr. Bhattacharyya explained the circumstances of the total solar eclipse, particularly along its path over India. He has prepared a booklet entitled 'Total Solar Eclipse, February 16, 1980 : Path of Totality in India' which includes the climatological data for the various sites along the path of totality.

Over the Earth's surface, the path of totality will begin in the Central Atlantic Ocean, cross Africa south of the Equator, sweep over the Arabian Sea,

southern India, the northern tip of the Bay of Bengal, southern Bangladesh, a small stretch of eastern India before ending over the South China at sunset. The maximum duration of totality will be 248 seconds off the east coast of Africa, at midday. The shadow cone will touch the Indian Coast near Karwar, Karnataka at about 3.40 p.m., lasting about three minutes, sweep north-easterly over Andhra Pradesh and Orissa passing over Japal-Rangapur Observatory south of Hyderabad, and cross the east coast over Puri at about 4 p.m. With the Sun at an altitude of about 35 degrees and usually clear weather in mid-February, observing conditions are expected to be ideal all along the belt of totality in India.

Following the introductory talk of Dr. Bhattacharyya the plans of I.I.A., Bangalore for optical observations of the total solar eclipse were reported by Dr. K.R. Sivaraman, plans of Uttar Pradesh State Observatory (U.P.S.O.), Nainital by Dr. V.P. Gaur, plans of CASA, Hyderabad by Mr. C. Raghavendra Rao and Mr. Anthony Raju and the plans of Vedshala, Udaipur Solar Observatory (VUSO), Udaipur by Dr. A. Bhatnagar. The various optical experiments planned by these institutes may be summarized as follows:—

1. Studies of the Coronal Spectrum: IIA, UPSO
2. Study of the Corona with a Fabry Perot Etalon : IIA, VUSO, CASA
3. Study of the Velocity Field of the Corona : IIA, UPSO
4. Study of the Polarization of the Corona : IIA, UPSO, CASA
5. Observation of the Flash Spectrum : IIA, UPSO, CASA
6. Measurement of the deflection of light by the Sun's Gravitational Field : CASA
7. Cinematography of the Solar Eclipse : VUSO, CASA

It may be noticed that there is duplication in almost all the experiments planned for the total solar eclipse. But this was considered desirable because even if some of the experiments fail due to poor weather conditions, others located at a different site may succeed. Sites for the location of these experiments have not been finalized yet, and CASA has offered the facilities of its Japal-Rangapur Observatory to the astronomers who wish to observe the total eclipse from there. Some of the experiments of the CASA will be conducted from other sites lying close to the central line of eclipse.

While discussing the optical experiments, two practical difficulties were pointed out. First difficulty concerns the need for accurate time signals for setting the clocks with an accuracy of the order of one milli-second. Dr. Y.V. Somayajulu of National Physical Laboratory (NPL), New Delhi informed the participants that at present the NPL is broadcasting ATA time signals of desired accuracy at 10 and 15 MHz from 9 A.M. to 8 P.M. I.S.T. each day for five days a week i.e., excluding

TABLE 1

Institution	Optical/Radio	Experiments planned for SMY
IIA, Kodaikanal	Optical and Radio	<ol style="list-style-type: none"> 1. Magnetic field of Sunspots 2. White light observations of the Sun 3. Observations of Ca II Plages 4. Observations with an Ionospheric Recorder
VUSO, Udaipur	Optical	<ol style="list-style-type: none"> 1. High resolution Hα photography 2. Full disc Hα photography 3. White light observations of the sunspots
UPSO, Nainital	Optical	<ol style="list-style-type: none"> 1. Hα photography 2. YLF—SPAS
Delhi University	Optical	<ol style="list-style-type: none"> 1. White light observations of the Sun 2. Full disc Hα observations of the Sun
PRL, Ahmedabad	Radio	<ol style="list-style-type: none"> 1. Radiometer observations at 10.7 cm 2. Radio Spectrometer observations at 25-75 MHz 3. High Frequency and time resolution observations of the Sun 4. Polarimetric observations 5. Millimeter range (5 to 30 GHz) observations of the Sun 6. Phase switched observations at 60 MHz for the study of noise storms 7. Sudden travelling waves in Interplanetary medium observations from three stations at Ahmedabad, Rajkot and Surat 8. Observations with Ionospheric Recorder
CASA, Hyderabad	Radio	<ol style="list-style-type: none"> 1. Radio Flux measurements at 3 cm 2. Observations with a continuous wave receiver to study the correlation between meteor activity and sunspot activity
NPL, New Delhi	Radio	<ol style="list-style-type: none"> 1. Observations with Ionospheric Recorder
Andhra University, Waltair	Radio	<ol style="list-style-type: none"> 1. Observations with Ionospheric Recorder

Saturdays and Sundays, and they have plans to transmit time signals continuously round the clock. The accuracy of the transmitted time is about 50 to 100 nanoseconds, while the time signal received after reflection from the ionospheric layers will have accuracy of a few milliseconds, which may be sufficient for most of the experiments planned for the eclipse. The second problem over which participants expressed anxiety was difficulty in importing certain photographic plates and films needed for astronomical applications. It is hoped that the experiments planned for the total solar eclipse will not have to be cancelled or curtailed for want of suitable photographic emulsions.

An important feature of the afternoon session was discussion of observations of total solar eclipse planned by amateur astronomers. Mr. Gopinath, a lecturer at the Birla Planetarium reported his plans to photograph and study the diamond ring visible at the time of total solar eclipse. Four students from Ahmedabad : Messrs.

P.S. Pandya, V.R. Kane, P.P. Patel, and P.R. Panchel are planning two experiments with equipment to be designed and fabricated by them. The first experiment concerns taking pictures of the solar coronal spectrum, and the second experiment concerns mapping of solar corona in a line emission with a Fabry Perot Etalon. Professional astronomers appreciated the efforts of the amateurs and a number of suggestions were given to them which it is hoped would improve these experiments.

The third and final session of the seminar held on the morning of March 16 was devoted to the Radio observations of the Sun and Earth's Upper Atmosphere planned at the time of total solar eclipse. (This session was chaired by Dr. J.C. Bhattacharyya). The NPL Radio Science Programme for the eclipse observations was described by Dr. Y.V. Somayajuly. These include a set of ground based experiments as well as experiments with rockets and balloons to study the changes in the characteristics of the earth's atmosphere and iono-

sphere at the time of total solar eclipse. The rocket borne observations would be carried out in collaboration with the Vikram Sarabhai Space Centre (VSSC), Tribandrum; and balloon borne experiments are planned in collaboration with the TIFR balloon launching facility at Hyderabad. Next Dr. B. Lokanadham of CASA discussed the research proposal submitted by him to the U.G.C., New Delhi for Solar Limb measurements at 3 cm wavelength in collaboration with Dr. R.V. Bhonsle of Physical Research Laboratory (PRL), Ahmedabad. Dr. Bhonsle who spoke immediately afterwards reported that besides the above experiment planned in collaboration with CASA, PRL plans solar limb measurements with their 2.8 GHz radiometer. They also plan solar limb measurements at 19.35 GHz, 22.235 GHz and 38 GHz in collaboration with the Space Applications Centre (SAC), Ahmedabad. All these radiometers will be located at the Japal-Rangapur Observatory. Next, Dr. R. Raghava Rao of PRL described the rocket borne experiments from VSSC, Trivandrum planned by the PRL group around the time of total solar eclipse to study the changes in the Earth's upper atmosphere. Finally, Dr. N.R. Deshpande of PRL described the ground based radio experiments planned by the PRL group at the time of solar eclipse to study the characteristics of the Earth's upper atmosphere.

The last paper of the third session was devoted to an entirely different aspect. Animals and birds are known to have been disturbed or frightened during a total solar eclipse. The effect of solar eclipse on the behaviour of a fresh water field variety crab *Barytelphusa Guerni*

was studied by Dr. K. Shankariah under the supervision of Dr. J.V. Ramana Rao of Zoology Department of Osmania University. They noticed reduced activity in the crabs during the partial solar eclipses in 1976 and 1977. They plan further studies on the crabs as well as on air breathing fishes during the coming solar eclipse.

The occasion of get together of the Indian solar astronomers was utilized by Drs. R.V. Bhonsle and A. Bhatnagar to hold a Workshop on the Solar Maximum Year (SMY, August 1979 to February 1981). This workshop held on the afternoon of March 16, was chaired by Dr. R.V. Bhonsle. Participants from the various institutions reported about their plans of routine solar observations during SMY. The optical and radio observations planned by various institutions are summarized in table. 1.

At the end of the workshop, a visit to Japal-Rangapur Observatory was arranged on the evening of March 16, to enable visiting astronomers to examine the various facilities that would be available to them for observing the total eclipse of the Sun. It is hoped that the opportunity provided by the seminar for planning of experiments for the total solar eclipse of 1980 would be justified by the success of various scientific experiments.

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ANNOUNCEMENT

The Fifth Annual and Scientific Meetings of the Astronomical Society of India will be held at Naini Tal between 5-9 November 1979 under the auspices of the Uttar Pradesh State Observatory. All ASI members are cordially invited to attend.

The meetings commemorate also the Silver Jubilee year of the Observatory.

Individual invitations on behalf of the Observatory and the Local Organizing Committee along with other informations, have been mailed to members.

Members not receiving the invitations in time are requested to write to the undersigned.

*Secretary
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K. R. Bondal