

EXPERIMENTS

By Dr J. C. Bhattacharyya

The main aim of the experiments undertaken by the observation teams from the Indian Institute of Astrophysics was to obtain photographs, spectrograms and photoelectric records during the brief duration of totality. These are critically examined after the event with a view to understand some effects often seen in the solar atmosphere. The records had to be taken with sensitive instruments under controlled conditions available in a regular observatory. The task required establishment of one or two full-fledged temporary observatories on the path of totality.

For photographing fine details of the structure of the solar corona, a few long focus camera systems were employed. The largest one, consisting of a camera lens of 12 cm aperture and 6 meters focal length, was provided with a plate magazine for successive snaps of the eclipsed sun on 25 cm x 20 cm sensitive, fine grain photographic plates. The pictures were obtained through an organ-red filter, and show the presence and delineation of coronal arches, plumes and streamers at different heights from the solar surface. The set of pictures has by chance, captured a coronal event, commonly called "transients"—a type of shock-wave phenomenon known to occur in the rarefield gas surrounding the sun.

Other photographs of the solar corona were also taken with special equipment. In one experiment a very narrow band filter was used to isolate only the red-line of the spectrum of hydrogen and the corona photographed in this light. Previously it was believed that this light can originate only in the chromosphere; but one of the findings of the Indian eclipse expedition to Mexico, in 1970, was detection of traces of this radiation in some regions of the corona. This year, the experiment was specially designed to confirm the earlier detection and to determine the extent of such regions. The results obtained during the last eclipse have provided confirmation of the earlier findings and a quantitative picture of its distribution.

The physical conditions in the solar corona are understood by study of the spectra of the emitted light. Temperatures, pressures, magnetic fields, movements *etc.* all leave their marks on the spectral line shapes. In an experiment, the distribution of the spectral profiles of a particular low excitation line originating from the coronal regions has been photographed. The plates are presently under intensive measurement and examination; the results are expected to give new information about these coronal regions where previous measurements are lacking.

In another experiment, the fall of intensity

during the last few seconds before totality, and first few seconds after totality has been photoelectrically recorded by using a specially designed spectrophotometer, at two wavelength positions in the spectrum at near ultraviolet and visible region. The aim of the experiment is to study the vertical structure of the uppermost levels of the solar photosphere. Analysis of the record is in progress.

The scientific data obtained during the total phase of the eclipse are extremely valuable, as the same provide rare information. Tests of many theories and speculations can be critically verified and new facts about the enigmatic physical reaction are uncovered during those precious seconds. The photographs, spectrograms or other forms of records of a total eclipse compose the permanent archives of human scientific endeavour from which an endless stream of knowledge continually flows.

About The Scientists

Prof. M. K. V. Bappu

(52), Director of the Indian Institute of Astrophysics, Bangalore, is noted for the Wilson-Bappu effect, which is extensively employed for finding distances to stars and several other discoveries of astronomical importance. Recipient of the 1970 Shanti Swarup Bhatnagar Prize, he became the first Indian to be elected President of the International Astronomical Union for the term 1979-82.

Prof. J. C. Bhattacharyya

is an experimental astrophysicist at the I. I. A. He is well known for his discoveries of a thin atmosphere on planet Jupiter's satellite, Ganymede, and an extended ring-like structure around the planet Uranus.

Dr Bart J. Bok

(75), Professor Emeritus at the University of Arizona, has had a distinguished career in astronomical research which almost parallels the growth of the subject of galactic astronomy. Winner of 1977 Bruce Gold Medal of the Astronomical Society of the Pacific (U. S. A.), he has been Associate Director of the Harvard College Observatory and Director of Mt Stromlo and Steward Observatories.

Dr R. C. Kapoor

(31) is with the I. I. A. whose interests range from bizarre objects like black holes and quasars to cosmology. The double cousin of the Editor, Ramesh is one of the proudest contributors of the *Hawk*.