THE ROYAL ASTRONOMICAL SOCIETY OF CANADA
Standing Committee on Observational Activities
Programme for Solar Eclipse of July 20, 1963

Bulletin No. 7 June 10, 1963

SPECIAL PROJECTS

Since the National Eclipse Committee began issuing this series of bulletins as a guide for those who intend to observe the forthcoming solar eclipse, a number of individuals have written describing more advanced or specialized projects which they intend to carry out. In addition, it was realized while the other bulletins were being prepared that certain of the programmes described should receive more elaborate treatment than was then possible. The purpose of this bulletin is to provide a more detailed description of some aspects of the proposed observation programme.

The list of projects herein is probably not complete. Hence we would be interested to hear of any other special projects which are being contemplated. If anyone still finds the information in this bulletin inadequate, he is invited to write to the co-ordinator for further information.

1. The Committee would like to draw attention to the directions in Bulletin No.3 for observing the flash spectrum with a diffraction grating and binoculars or a telescope. Transmission gratings allow most of the incident light to pass through in a "white" beam. This beam must be avoided as it will injure the eye. The spectrum emerges from the grating at a fairly wide angle to this beam, and this angle can be best found experimentally by placing the grating over the objective and projecting the image onto a white card. When the spectrum emerges straight out behind the eyepiece, the white beam should not be visible at all. For maximum safety the instrument should be mounted so that it will not accidentally be aimed at the sun when the observer looks in.

2. Since Bulletin No.4 was published, Kodak has issued a revised booklet on solar eclipse photography. Although substantially the same in most respects as the original edition, it contains the following points which are worth mentioning:

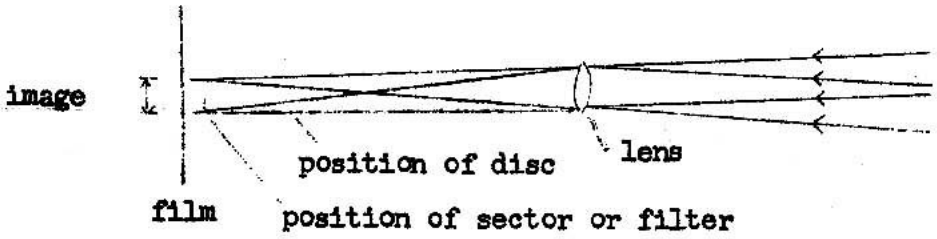
   (1) Neutral density PHOTOGRAPHIC filters are not suitable for visual use, since they transmit infrared rays which can burn the eye.

   (2) When preparing to photograph the corona, bear in mind that Kodachrome II has a speed of ASA 25, raised from 10, and Tri-X pan film is now rated at 400 instead of 200.

   (3) The following section of the exposure table needs to be revised as noted:

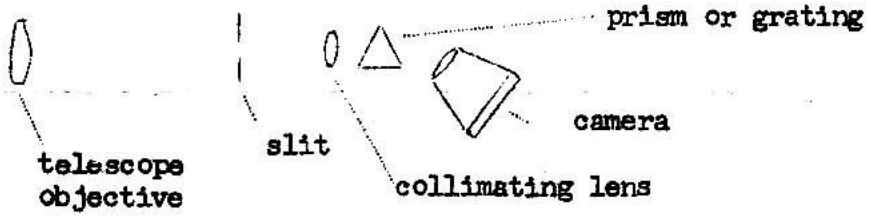
FILM	INNER CORONA		OUTER CORONA	
	old	new	old	new
Tri-X	f/8 @ 1/10	f/16 @ 1/10	f/8 @ 1/2	f/16 @ 1/2
Roy. Pan	"	f/11 @ 1/10	"	f/11 @ 1/2
High Speed Ektach.	"	"	"	"

3. Photography of the Corona: It is seen from the table in the last paragraph that the outer corona requires about five times the exposure sufficient for the inner corona. To record the fainter details without over-exposing the bright inner parts, some device must be used to reduce the light reaching the film in increasing amounts toward the centre of the image to, say, 1/2 that entering at the edge. For this purpose, three methods may be recommended:
(1) a rotating sector shutter in the image plane, centred on the image;
(2) a circular filter dense at the centre and thinning out toward the edge;
(3) a small disc (comparable in size with the diameter of the image) placed inside focus. The positions of all three are shown in the diagram below:



4. Spectroscopic Projects: Photography of the flash spectrum was described in Bulletin No.4 and need not be repeated. However, for photographing the spectrum of the corona or of the light in the sky, an entirely different approach must be used. A telescope must be used to gather light. Instead of the eyepiece, a slit is mounted in the focal plane and the usual train of collimating lens, grating or prism, and camera lens must be employed as shown in the diagram. While a diffraction grating has the advantage of giving a constant dispersion, the brighter spectrum from a prism permits shorter exposures.

The writer has been unable to find any information concerning exposure times; however, the corona is usually rather less bright than the full moon, and on this basis it is suggested that those undertaking spectroscopic work should practise on the moon, and then, knowing the necessary exposure for the moon, give twice or four times this exposure at the eclipse itself (preferably both, if there is time).



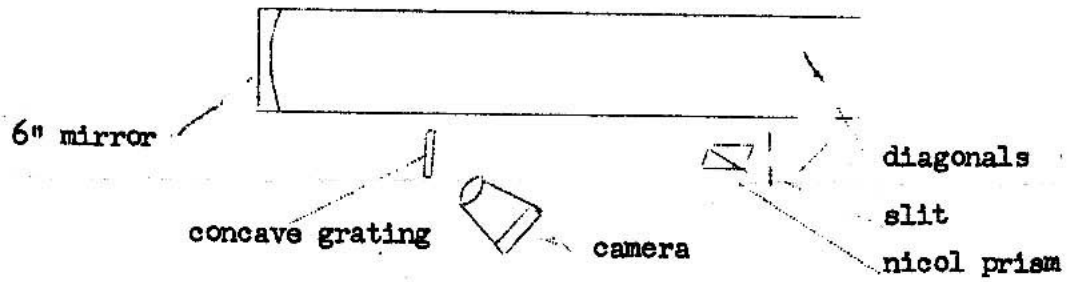
5. Measurement of the Colour of the Corona: Past experiments suggest that the colour of the inner corona is not the same as that of the outer corona, but results vary. This sort of information can be obtained by measuring the darkening at different points on photographs of the corona taken through red and blue filters, and comparing red and blue for different parts of the corona. This method, although simple in principle, is easily made worthless by insufficiently accurate calibration and by spurious effects caused by scattered light.

Probably the best filters to use are the Wratten 25 (red) and 47 (blue); (see Handbook of Physics and Chemistry). At least one short and one long exposure must be made through each filter during totality; a total of four or more, each lasting several seconds. Although the image on the film must be of reasonable size, it is obvious that a rather "fast" optical system must be used. A steady, clock-driven mounting is essential. A medium-grain black-and-white film is probably the best to use.

In submitting his results for analysis, the observer should enclose the actual filters used, as these are not perfectly uniform. For the purposes of calibration, all exposures must be made on a single roll of film, which is also to be used later to make test exposures for determining the film's characteristics, notably the relations between wave-length and sensitivity, and between exposure time and darkening. The lengths of the exposures must in all cases be known very accurately, and a note on the estimated accuracy of measurement must be supplied.

6. Photography of the Spectrum with Polarized Light: It has been found in the past that the light from the corona is polarized. One observer intends to take photographs of the coronal spectrum through a polarizing prism, rotating the latter between exposures, to determine whether the polarization is the same for all the (emission) lines, or whether the effect varies for the lines of different elements.

It is hoped that there will be enough time to make four exposures during totality, using a 6" f/10.5 reflecting telescope with a grating spectrograph as shown in the diagram. After the end of totality a number of comparison spectra will be made from the sun and from an incandescent bulb, in order to offset errors arising from interference fringes caused by a lacquer coating over the surface of the grating to be used.



7. Recording Changes in the Flash Spectrum: A well-timed succession of spectrograms showing the reversal of the lines at the onset of totality is of value. For the 1959 eclipse three members of the Ottawa Centre devised the camera shown here. A description follows:

"Our camera lens was an air-spaced achromat of diameter 4 in. and focal length 42 in. We used no slit, but mounted a large diffraction grating ..., in front of the lens. (It) had about 5000 lines/inch and .... was blazed in the first